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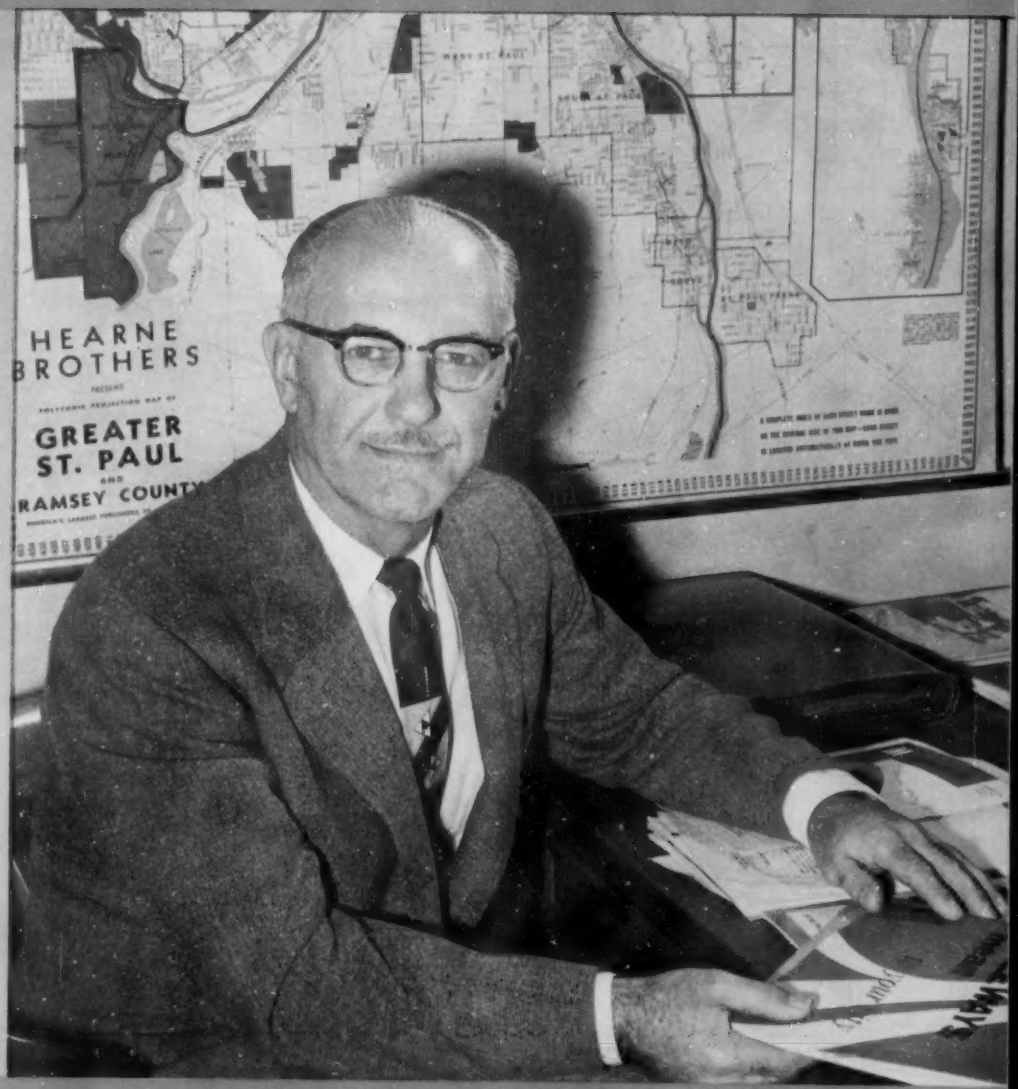

Arthur W. Tews, Chief Engineer of St. Paul, Minn., has had many years experience in civil and municipal engineering, including ten years as City Engineer of Duluth. More about him on page 22.

CONTRACTORS are strong for GALION ROLLERS

J. R. FORD COMPANY HAS 28 OF THEM!

J. R. FORD CO., INC.
GENERAL CONTRACTORS AND ENGINEERS
LYNCHBURG, VIRGINIA

October 8, 1956

The Galion Iron Works & Mfg. Company
Galion, Ohio

Gentlemen:

We are glad to give you permission to use the picture of the Galion roller.

We like the Galion roller very much, and we have 28 of them - 7 three wheel, one trench roller, and 21 tandems.

Galion rollers are simple, easy to keep up, and we have been very fortunate in dealing with a dealer who carried a full line of parts and whose service was unparalleled if and when service was needed which was on rare occasions.

Yours very truly,

J. R. FORD COMPANY, INC.

Jesse R. Ford

Jesse R. Ford,
President

JRF:nf

Galion rollers are simple, easy to keep up, and we have been very fortunate in dealing with a dealer who carried a full line of parts and whose service was unparalleled if and when service was needed which was on rare occasions.

J. R. Ford, President of Ford Construction Co., Inc., has standardized on GALION Rollers because he has found they pay off — in better work, long service, and more profitable operation.

You need GALION Roller performance to meet the stiff specifications, keep work on schedule, and make a good profit on those big jobs on the mammoth National Highway Project. Modernize your roller fleet by standardizing on the BEST — Galion ROLL-O-MATIC Tandem and Three-Wheel Rollers.

See your Galion Distributor without delay or write today for complete information.

THE GALION 1907 50th ANNIVERSARY 1957

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TRENCH ROLLERS · PORTABLE ROLLERS · 3-WHEEL ROLLERS · TANDEM ROLLERS · MOTOR GRADERS

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Cable address: GALIONIRON, Galion, Ohio

"from Chicago"

COMPLETE, LOW COST, MODERN SEWAGE TREATMENT PLANT AVAILABLE THROUGH USE OF SWING DIFFUSER AERATION EQUIPMENT

Gallatin, Tennessee Sewage Treatment Plant — J. Sanders Parker, Consulting Engineer.

- This compact, attractive, plant features a wide variety of Chicago Pump Company sewage treatment equipment. In the heart of the treatment process it is completely equipped with Swing Diffuser Aeration Units. Also included are "FLUSH KLEEN"® Sewage Ejectors, Chicago Comminutors, Chicago Floating Digester Covers, Chicago "Standardaire" Blowers, Chicago "Cyclotherm" Heat Exchangers, and various pumps and other equipment.
- Swing Diffuser Aeration Equipment insures highest oxygenation efficiency, available as required now or in the future.
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Subsidiary of Food Machinery & Chemical Corporation

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"OUR NO. 212 IS PLENTY ABLE TO DO ALL THE WORK WE NEED"

H. D. Flowers, Street Supt., Lincoln, Calif.

The city of Lincoln, in Placer County, California, has 35 miles of roads and streets to maintain. A Caterpillar No. 212 Motor Grader does the ditching, blades the shoulders and spreads mix. In over five years of steady work the machine has been out of service only twice —to have the tires recapped and one starting engine overhaul only.

Street Supt. Flowers says: "Our No. 212 is easy to get around with and it's plenty able to do all the work we need. There's a big saving in fuel over other graders the city has owned. The full revolving circle on the blade saves time, too. And for long, dependable, economical operation, it's outstanding."

Many cities and counties find the CAT* No. 212 meets all their needs. It's the smallest and lowest-priced grader in the Caterpillar line, but it's ruggedly built to do everything the larger machines can do. It just takes a little more time. The 50 HP Caterpillar Engine is tough, simple, dependable, and burns such low-cost fuels as No. 2 furnace oil without fouling. With its positive-acting controls, full range of blade positions and excellent job visibility, the machine is easy to operate. New tubeless tires, at no extra cost, do away with tube and flap trouble and cut down time.

The No. 212 may be just the grader needed to do a job for your taxpayers and save them money. Ask your Caterpillar Dealer for a demonstration on your own roads. His reliable parts and service facilities stand behind your investment.

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CLOW BELL-TITE CAST IRON PIPE

costs less to buy, less to lay!

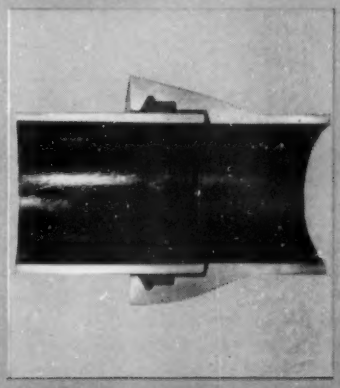
Assembly is simple. First, the joint is wiped clean.

Second step — insert gasket as shown into groove in bell.

Third — apply thin film of special lubricant to the gasket.

Next—push home the spigot, first centering plain end in bell.

No bell holes are required. Installation is very rapid.



Result—a safe, economical joint with a tight, permanent seal.

The NEW CLOW BELL-TITE cast iron pipe joint is a rubber seal joint that requires NO bolts, NO nuts, and requires NO wrenches to lay. It takes less time to install. It costs less to buy. Here's economy PLUS.

The Underwriters' Laboratories, after testing the joint, have approved its use for water working pressures up to 350 psi. CLOW BELL-TITE pipe barrel meets all quality provisions and physical requirements of all applicable ASA, AWWA, and/or Federal Specifications for cast iron pipe.

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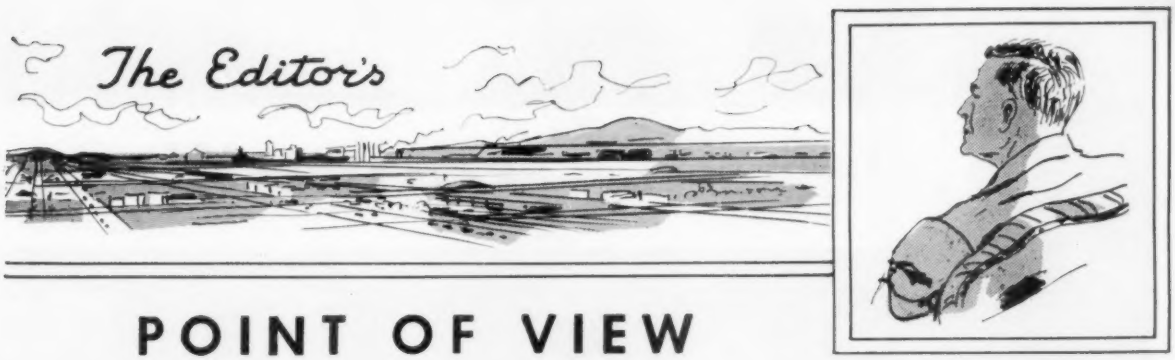


POINT OF VIEW

The Price Usually Isn't High Enough for Safety

"BUT YOU SAYS, Parson, that 'Salvation is free,'" objected the colored church deacon pressed to put only folding money in the collection plate. "So is water," countered the preacher, "but somebody is got to pay for the pipes that fetch it."

The old rural ideas of water being free because it came from a spring or well have been carried too far and too long into this modern age. Water is not free to the urban dweller but it is perhaps the most woefully underpriced commodity in his budget. All other prices have gone up materially but water has risen little, if any. The result is that many water plants are starved out on many lines: starved out in the salaries paid, which are so low as to make personnel replacements increasingly difficult; and starved out in ability to finance needed equipment and modernizations. Too often the consequent result is an inferiority complex that makes many water works heads reluctant to fight for the money that would enable them to give adequate service with expanded and more efficient plants. They have felt forced into a defeatist policy of rebelling at air-conditioning and restricting lawn and garden sprinkling, instead of promoting their revenues by encouraging a larger use of their product. If business tried to hold down its sales as some of these inadequate plants must, national growth would be impossible and earnings so curtailed that the "hair curling" depression would be a reality.

Every thoughtful citizen will recognize the changes in our times and prices and the justice of a demand for an adequate income for our most vital necessity. Isn't it time for the water works fraternity to realize its importance, cash in on its potentialities for larger sales, and switch from the negative to the boldly positive in thinking and in actions?

Getting Ready for the Big Road Program

THE OUTLINES OF the Interstate Highway system have been pretty well determined. Most of the cities and counties which are to be touched by these magic ribbons know that this will happen. The question is: "What is being done to get ready?"

The big cities and the populous counties are comparatively well off in engineering skills and resources; but there are many communities and areas that lack these facilities. This does not mean they can do nothing but sit and wait. We suggest picking a smart young man and giving him the responsibility for collecting every bit of information he can about the impact of this road-building program on the community.

The state highway department, chain restaurants, stores, real estate men, local businesses, utilities and developers and builders are some of the potentially fruitful sources of news of expansions and possible new developments which may affect the local community in many ways. The city and county engineer can plan better for the future and keep local officials better informed if he knows reasonably in advance, what is likely to happen. He should start now to organize an intelligence service.

Biological Warfare Possibilities and Problems

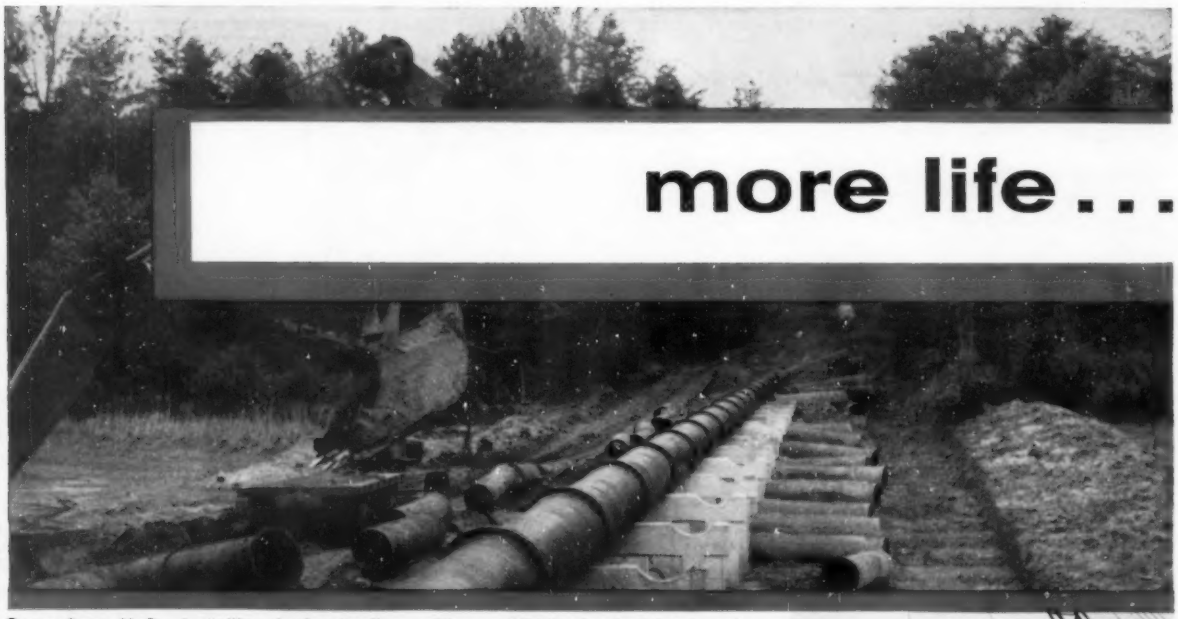
MUCH THOUGHT HAS been given to the possibilities and problems of biological warfare. This was a pretty hot subject in World War II and not all of the problems and solutions of these days have been made public. It is still an important subject and a continuing one. At present, it is being studied by medico-military men, among others, but little consideration appears to be given to the need for engineering skills and for the place engineers would have in an ABW program. If engineers are to be of real help in time of need, they should participate in current studies and planning because the need may develop very suddenly; there will be no time for training and orientation courses.

This is a problem whose solution requires a high degree of teamwork on the part of many skills and the team ought to be complete from the start.

There is No Substitute for a Planned Program for Cleaning Sewers

SEWERS GET DIRTY, which should be no surprise, considering the nature of the material they carry. Eventually they need cleaning, and there is no magic method of doing this—no alchemists formula to add to the sewage which will leave the interior of the pipes clean and bright. Fortunately, however, modern equipment has made the job immeasurably easier, quicker and cheaper.

Cleaning is necessary both to preserve the capacity of the sewers to do their designed job and to facilitate good operation of the sewage treatment plant. For every sewer system there should be a planned program of sewer maintenance which should include regular and efficient cleaning.



more life . . .

Greensboro, N. C.— Installing dual water lines with new 30" Mechanical Joint cast iron pipe alongside salvaged 24" Bell-and-Spigot cast iron line in service approximately 25 years.

A cast iron pipe line is being installed. Whatever it's used for, chances are it won't be seen again for a hundred years or more. Proof of this statement is in the record! Nearly seventy American cities are still using cast iron mains laid over a century ago.

And the *modernized* cast iron pipe available today is even stronger, longer lasting, more economical. No wonder engineers from coast-to-coast specify cast iron pipe for more uses every year. They can rely on it to do the job and do it well.

Oklahoma City, Okla. — Installing 30" cast iron pipe for floodway siphon in municipal sanitary sewer system.

CAST IRON PIPE

more uses!

Burlington, N. J. — 20" flexible joint cast iron pipe for Delaware River water line crossing from Burlington Island to Water Plant.

CAST IRON

For information, write: Cast Iron Pipe Research Association,
Thomas F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Illinois.

SERVES FOR CENTURIES...

Don't play games...

get Le Roi's new shock-absorbing rock drills!

You're a winner every time, too, with Le Roi's new shock-absorbing sinkers. They take away an amazing 55% of the punishing kick normally transmitted from the hammer to the operator—yet never lose an ounce of rock-shattering impact. This makes drilling so easy, we don't know how your operators can keep from playing tic-tac-toe.

See these new easy-handling long-life rock drills at your local Le Roi distributor. He's got the new Model H10, H111, and H12 sinkers in stock right now . . . available for fast delivery. Or write Le Roi Division, Westinghouse Air Brake Company, Milwaukee 1, Wisconsin.

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HYDRANTS

A.W.W.A.

EASY TO OPERATE AND MAINTAIN

Ludlow hydrants incorporate all the advantages and meet all the requirements for safety, durability and economy.

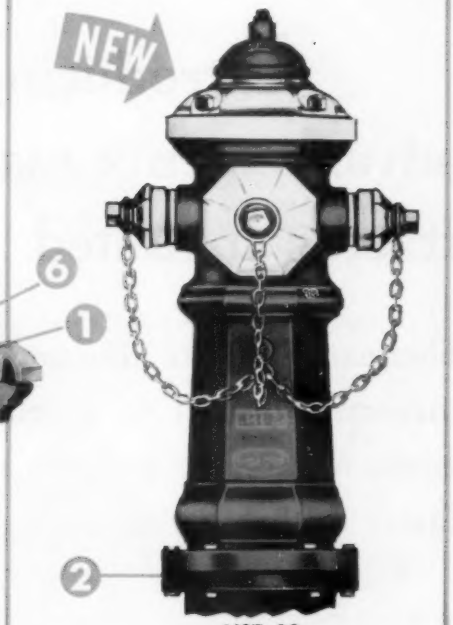
HERE'S WHY:

1. **POP-OFF SLEEVE COUPLING:** releases hydrant head from stem in event of traffic damage.
2. **BREAKABLE GROUND LINE FLANGE** eliminates digging.
3. **NO FLOODING.** Closed hydrant remains locked—even in event of traffic accident.
4. **NO FREEZING.** Positive drip action, at extreme bottom, assures complete drainage.
5. **90,000 TENSILE STRENGTH** rolled Everdur threaded stem section completely eliminates stem failure.
6. **LESS OPERATING TORQUE.** New, non-binding upper and lower "O" rings trap lubricant . . . assure positive water tight seal . . . require no servicing.

THE RESULT: LOW INITIAL COST—YEAR AFTER YEAR—OF TROUBLE-FREE SERVICE.

"NO POSSIBLE DIFFERENCE IN FIRST COST CAN OVERBALANCE THE PERPETUAL ECONOMY OF QUALITY."

15



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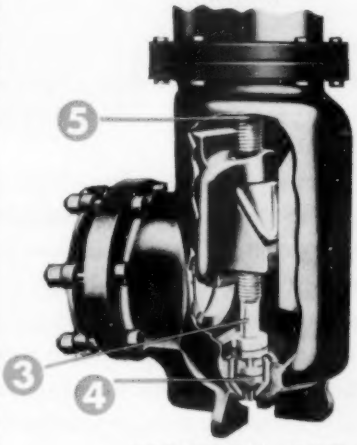

MECHANICAL JOINT END

Ask for Bulletin 54-H

LUDLOW & Rensselaer

LUDLOW RENSSELAER **VALVES & HYDRANTS**

Since 1861 **THE LUDLOW VALVE MANUFACTURING CO.** *Troy, N. Y.*

Introducing the greatest advancements made to date in tractor mounted backhoes

Sherman Products announces all new digger with increased output to speed digging and reduce costs. Many new features make this Model 54F faster with less maintenance and longer life

HOLES IN THE GROUND—that's what you are really buying when you purchase a backhoe. You aren't interested in a group of parts as such. You are interested in the capacity to dig holes at the lowest possible cost—so that you can sell those holes at a profit.

This means you need a fast, dependable digger with a long service life and low maintenance.

Now, Sherman presents an *all new* power digger that meets these requirements! It has advanced features that make it faster than any comparable backhoe . . . it is so sturdily constructed that it will outlast any comparable backhoe . . . it is so engineered that it requires less maintenance than any comparable backhoe.

Look over the list of Sherman features and you'll see for yourself.

Every single one of these features has been thoroughly tested. In actual digging in all types of soil conditions including hard, frozen clay and sticky gumbo, the Sherman completed 500,000 cycles—the equivalent of two years of normal operation—and was still going strong.

Compare the new Sherman with any tractor mounted backhoe. Make sure that the digger you buy has *all* of the features you need.

Don't take our word for it. Put the Sherman on any job and *clock it* with a stopwatch. Prove to yourself that the Sherman saves you money by producing more work per dollar invested in time, equipment, maintenance, and manpower.

The all new Sherman breakaway capacity of 9000 lbs. is greater than any comparable backhoe. This revolutionary Sherman development means more power and faster digging.

The all new Sherman is fast and powerful because short hydraulic lines reduce friction power loss. And the exclusive pump drive in combination with the Sherman Planetary Step-up Transmission contributes to greater speed than conventional systems, as does the outstanding pump pressure of 2000 psi.

The all new Sherman has a wide work radius and a long reach—an **uninterrupted** arc of swing of 188° together with a 12 ft. reach below grade and a loading height of more than 9 ft.

The all new Sherman holds steady on sloping or uneven ground because the hydraulic stabilizers, individually controlled, give both lateral and angular support and the 12″ by 14″ foot plate assures maximum ground contact.

The all new Sherman can be dismounted in

Arc of Swing: 188°, Uninterrupted
Reach at Grade from Shovel Teeth to Tire at 90° to Tractor: 12′ 2½″
Stabilizer Spread: 8′
Reach Below Grade: 12′
Reach from Axle at Grade: 18′
Length of Excavation from One Tractor Position: 15′ 8″
Rear Axle to Center Line of Swing Post: 38″
Shovel Clearance Height: 9′ 2″
Shovel Teeth Clearance Height Fully Dumped: 12′ 6″
Transport Position Measurements: 9′ 8″ high; 6′ 4″ wide; 11″ ground clearance
SHERMAN

a few minutes by simply removing six pins and four bolts.

The all new Sherman has an efficient, all purpose shovel with quick adjustment for straight walls or high loading; full rollback for heaped, non-spilling loads; tapered side cutting edges to prevent binding; replaceable teeth.

The all new Sherman is comfortable because the seat is adjustable and the full, anti-skid deck permits leg position changes.

The all new Sherman lasts longer, costs little for maintenance. Here are a few of the reasons:

- Main and swing frames are heavy-duty steel plate, weldment construction.
- Full length, box construction sub-frame increases tractor rigidity and acts as a spring-like shock absorber.
- Reinforced, "stress-design" box construction boom with crowd cylinder operating inside for complete protection.
- Heavy roller chain couples the twin, single acting, swing cylinders to post sheave.
- Reinforced, "stress-design", box construction dipstick.
- Hydraulic reservoir is oversized for maximum oil cooling. Its central location and independent suspension eliminate possibility of leaks due to operating stresses.

Yes, the facts prove that the Sherman Power Digger is today's best buy in tractor mounted backhoes.

Sherman Power Diggers are Engineered Exclusively for Ford Tractors and are Sold and Serviced by your Ford Tractor Dealer

•

Write for Bulletin No. 565

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Z-7

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...and the NEW DAVIS 210 BACK-HOE is the ONLY MACHINE in the World— that can do this job!

When it comes to digging a footing or any other trench for service lines, waterproofing, etc., right alongside another building, you have only two choices – either expensive hand digging or fast, economical flush digging by a new Davis 210 Back-hoe. The new Davis 210 can be mounted at either end of the frame – as well as at the center so you can dig flush with walls, fences, etc. Its 200° swing lets you dump far enough from the trench that removal of the excess pile with the Davis Loader, America's quality loader, is easy.

It's all made possible by the exclusive rotary hydraulic boom swing cylinder along with the other features which make Davis the world's largest selling back-hoe – features like the 7000 pounds of breakaway for digging in asphalt or frozen ground, independently controlled hydraulic stabilizers, five minute detachability, and revolving seat which lets the operator always watch his work. Of course with the Davis Loader you have an unbeatable combination... all for far less than you would expect to pay in comparison to other makes.

DISCOVER DAVIS FOR MORE PROFIT

Davis Loaders and Back-hoes are available for all popular makes of tractors, and sold and serviced everywhere in the U. S. A. and Canada by better dealers. For the name of your nearest dealer call Western Union by number and ask for Operator 25... or write...

MID-WESTERN INDUSTRIES, INC.
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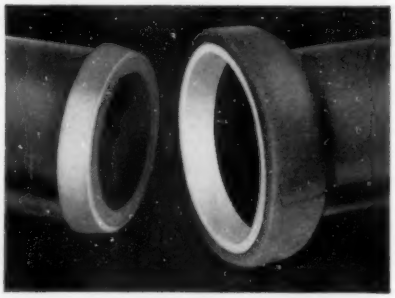
you save money SEVEN WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint
on pipe 4 feet long or over
Available in 4" through 24" diameters



More than 200 major installations have been completed with outstanding results since Amvit Jointed Clay Pipe was introduced in 1955.

Such pioneer cities as Ann Arbor, Michigan, Dayton, Ohio, Camden, New Jersey have installed their second and third Amvit sanitary lines.

A mechanical joint designed for quick, low-cost installation, Amvit* will give you lower cost-in-place. Here's how:

1. QUICK INSTALLATION SAVES LABOR

No other materials such as caulking, joint compound, hot pots, or ladles are needed to make the Amvit joint. The joint is on the pipe delivered to the job ready for use. Just push the pipe together and the joint is complete.

2. IMMEDIATE BACKFILLING

You can backfill as soon as the line is completed. Barricades can be removed and streets opened days sooner.

3. QUICK TESTING

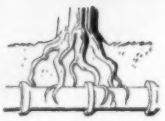
No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

4. CONTROLS INFILTRATION

Field tests from completed installations show that infiltration can be definitely controlled. Engineers can, thus, reduce infiltration specifications, use smaller diameter pipe and save in material cost.

5. ROOT PROOF

Amvit is a compression joint on the ball and socket principle. The surfaces of both bell and spigot are in uniform compression preventing root penetration.



6. BETTER FLOW, LESS MAINTENANCE

The design of the joint assures that the pipe is self-centered at all times. This gives perfect alignment and self-cleansing. Because the joint is really tight, no foreign matter such as dirt, sand and stones can possibly enter the line.

7. COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

Amvit Jointed Clay Pipe, in sizes 4" through 24" together with all fittings is available for immediate delivery in the Northeast and Central States.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

*T. M. Registered. Patents Pending

SINCE 1900

AMERICAN

American Vitrified Products Company

CLEVELAND, OHIO

MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

Plants Across the Nation . . . Brazil, Indiana · Chicago, Illinois · Cleveland, Ohio · Crawfordsville, Indiana · Detroit, Michigan · East Liverpool, Ohio Fenton, Michigan · Grand Ledge, Michigan · Lisbon, Ohio · Los Angeles, California · Milwaukee, Wisconsin · South Bend, Indiana · Uhrichsville, Ohio

More work capacity, with less investment

HOPTO®

DIGGER - SHOVEL - CRANE

Heaviest-Duty, largest GPM Hydraulic System Available!

MODEL 200
DTM 57-72

NEW GREATER REACH,
LOADING HEIGHT,
DIGGING DEPTH
EXTRA HEAVY-DUTY
72 GPM TRIPLE TANDEM
PUMP AND SPLIT
VALVE BANK

13½' DIGGING DEPTH

11½' LOADING CLEARANCE

COMPACT, MOBILE

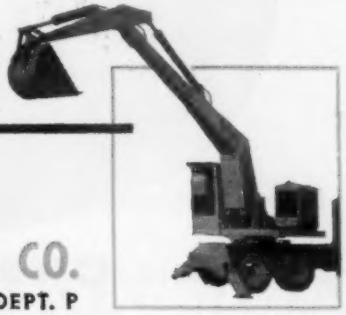
Take any 2-ton or larger truck (even one you've already written off) mount this HOPTO, and you've got a mobile, fast-cycling, completely hydraulic digger, shovel or crane for less cost than you ever thought possible!

Your HOPTO 200 DTM 57-72 features a 72 gallon per minute triple tandem pump that feeds a split valve bank. This split hydraulic system means more efficient, faster and cooler operation. The redesigned dipper stick lets you dig to 13½ feet, gives you a ground reach of 19 feet and a backhoe loading height of 11½ feet. This new HOPTO handles a 30" backhoe through 200° continuous swing . . . has four easily mastered control levers for fatigue-free . . . *more profitable* operation!

RUGGEDLY BUILT—2-WAY VERSATILITY!
Big 5" ID cylinders on hoist, crowd, and bucket control hydraulic outriggers, individually controlled from operator's seat, and husky over-all construction add to the HOPTO's long, *money-making* life! The same boom and dipper stick mount a backhoe or shovel bucket . . . you switch from backhoe to shovel in minutes. You get *more* out of the HOPTO because it's built to do more jobs . . . *better*, at lower cost!

TRAILER MODELS
The new HOPTO is also available in either self-powered or PTO-operated trailer models. Check with your dealer for the model that best meets your needs.

HALF-YARD HOPTO 360
New Model 360-57-90 HOPTO offers 360° continuous swing, 90 GPM triple tandem pump and split valve bank . . . heaviest duty available! Handles ½ yard backhoe easily. Thirty-second set-up time!



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For Complete Information

BADGER MACHINE CO.
WINONA, MINNESOTA. DEPT. P

CHAPMAN

Beamed Waterway Gate Valve

Here's the point. On a Chapman Beamed Waterway Gate Valve in the partly opened position, there is six to ten times more contact bearing surface than with any other double disc parallel seat or square bottom gate valve. They're rugged. They're built for service. For filtration plants, wash water service, or other similar limited throttling use, they'll last for decades with little or no maintenance.

Operation is always smooth. There's little or no leakage. The seats are tight and snug. And they have bronze bearing surfaces on beams and downstream disc for longer life and better performance.

All sizes with any method of operation you need are available. You'll see more about them in our Catalog No. 45. Write for your copy now.

THE CHAPMAN VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASSACHUSETTS

Important Angle

There are many things about street lighting poles—*details* of construction, materials and assembly—that add up to a mighty important angle. They make a big difference *through the years!*

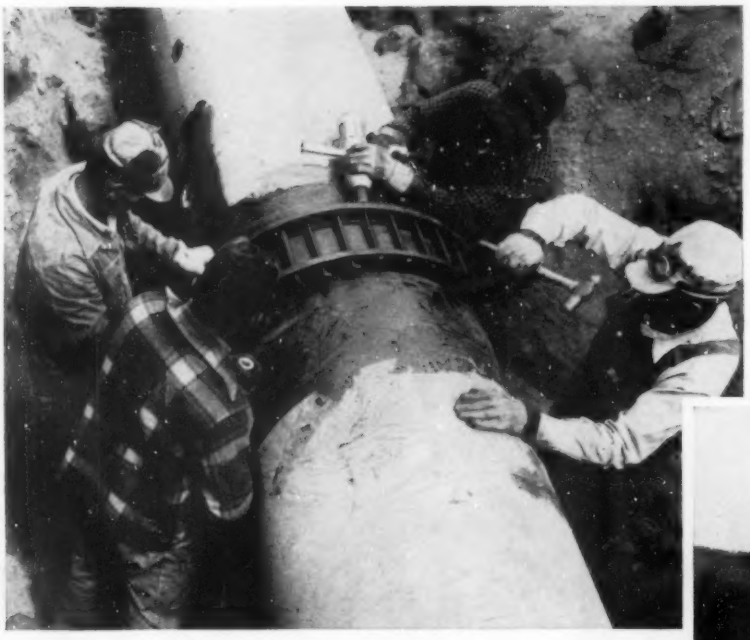
Monotube poles give lasting satisfaction. They are backed by years of research, development and experience!

For catalogs or specific engineering data, write to The Union Metal Manufacturing Company, Canton 5, Ohio

In Canada: The Union Metal Manufacturing Company of Canada, Limited, Brampton, Ontario.

UNION METAL

Monotube Lighting Poles



DELIVERING WATER CHEAPER

Four-man crew using power wrenches assembles this Dresser Coupling in minutes. Dresser Couplings tested bottle-tight on line pressures up to 800 psi.

Cranes lowered the long sections of steel pipe into the trench as fast as the assembly crew could position and couple them.

54 Miles of 30" Dresser-Coupled Steel Pipe Installed in 68 Days at Colorado Springs!

Water supply problems are nothing new to Colorado Springs. Back in 1924, the city constructed a steel pipe line to collect runoff from the south slope of Pikes Peak. That line has been giving dependable, trouble-free service ever since, so it was experience plus good engineering judgment that led to the choice of steel pipe with Dresser Couplings for the city's latest 54-mile addition to its water supply system.

Colorado Springs profited from experience with this 20" pipeline laid 33 years ago. Flexibility of Dresser Couplings make it possible to lay long radius curves using straight lengths of pipe.

The high beam strength of steel pipe plus the adaptability of Dresser Couplings makes them the ideal combination for irregular terrain.

The new 30" line runs from Montgomery Dam to Lake George — over some very rugged terrain — to deliver 18 mgd to Colorado Springs and to help supply the new U.S. Air Force Academy nearby.

Here's how Dresser Couplings helped make it possible to install this 54-mile line in 68 working days: A four-man crew, using power wrenches, assembled the Dresser Couplings on the pipe . . . some in as little as two minutes. Next, a two-man crew pulled the coupling bolts up to proper torque. The line was laid *at the average rate of about 4,200 ft. per day.*

For a bottle-tight, trouble-free line that *delivers water cheaper,* it pays to specify steel pipe with Dresser Couplings. Dresser Manufacturing Division, Bradford, Pennsylvania.

ONE OF THE DRESSER INDUSTRIES

the economy of size

A 14 ft. inside diameter, 16 ft. long section of subaqueous reinforced concrete pipe enroute to installation site via American's special-built 99 ft. truck and trailer. Weight per pipe section was reduced from an estimated 75 tons to 50 tons by use of lightweight concrete aggregates.

A new steam station at Huntington Beach, California is another project in the long-range program of the Southern California Edison Company which has been undertaken to provide needed kilowatts for Southern California's dynamic industrial and domestic growth.

In solving the problem of circulating 352,000 gallons of sea water per minute from a point approximately 2500 ft. out in the Pacific Ocean to the plant's condensers and back again, Edison's engineers called upon American Pipe and Construction Co. to help design and to manufacture the largest diameter precast reinforced concrete subaqueous pipe ever made. Each individual pipe section has an inside diameter of 14 ft.

American's ability to manufacture and handle these huge pipe made feasible the use of two parallel pipelines of this size rather than four lines of approximately 9 ft. diameter pipe otherwise needed to circulate the required volume of water. Here, indeed is economy of size.

Take advantage of American's 50 years of research and experience for your next project. Write or telephone for information.

our 50th year

CONCRETE PIPE

FOR MAIN WATER SUPPLY LINES, STORM AND SANITARY SEWERS, SUBAQUEOUS LINES

American PIPE AND CONSTRUCTION CO.

Mail address:
Box 3428 Terminal Annex, Los Angeles 54, Calif.

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District sales offices and plants:
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digs more trenches in more places at less cost—and

fits more jobs!

THIS CLEVELAND 92—a compact maneuverable "Baby Digger"—is doing a neat job of digging from driveway to driveway in a tree lawn that's really *narrow.* The operator sets in and lifts out the digging wheel with speed and safety because the 92 gives him full job visibility and fast accurate boom hoist control. Synchronized wheel and conveyor speeds permit precision placement of spoil. No damage to curb, sidewalk or driveways either, thanks to the 92's perfect balance on long, smooth, non-clog crawlers —a real public relations asset.

The Cleveland 92 "Baby Digger"

- Digs all soils
- Digs in any weather
- Only 54" wide over crawlers
- Digs 10" to 20" wide
- Digs to 5' deep
- Power-shift conveyor
- Reversible discharge
- Portable, at legal limit speeds

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

LEADER IN PUBLIC WORKS

Arthur W. Tews is Chief Engineer for the city of St. Paul, Minn. For 10 years City Engineer of Duluth, he became Assistant Chief Engineer of St. Paul in 1955; on January 1, 1957, he was promoted to Chief Engineer, succeeding George M. Shepard, who was promoted to the newly created position of Highway and Street Engineering Coordinator for St. Paul.

Mr. Tews received a BS in Civil Engineering from the University of Minnesota in 1924. Upon graduation he joined the Minnesota Highway Department as instrumentman, being promoted to Project Engineer and then to the District Headquarters Office in Duluth in charge of street design and construction. In 1945 he left the Highway Department to become City Engineer of Duluth. As Chief Engineer for St. Paul he is responsible for all engineering, construction and maintenance of streets and bridges.

Mr. Tews also has been active in Professional Engineering Societies. He is a member of the Northwest Section, and past vice-president of the Duluth Section, of ASCE; member and past president of the Minnesota Society of Professional Engineers; past president of Arrowhead Chapter MSPE; past president of the City and Village Engineering Association of Minnesota; and a member of APWA and the Minnesota Surveyors and Engineers Society. He is a member of Olivet Congregational Church in St. Paul.

Mr. and Mrs. Tews have a daughter who is in her second year at Macalester College and a son who is in his first year at St. Paul Central High School.

Mr. Tews has maintained his intense interest in all types of athletics. He is the proud possessor of a hole-in-one trophy, acquired in Duluth in 1950. He does as much hunting and fishing as he finds time to enjoy. Gardening is an almost daily hobby during the summer months.

— a season of operation *with* NO TIME OUT FOR REPAIR

That's the record made in Appleton, Wisconsin, last winter by the Fox Mountable Spreader pictured above. This great record of continuous operation was made possible largely because of the *Fox Auger Feeder.*

Because the Fox Auger Feeder completely eliminates troublesome conveyor chains and drag bars, it also does away with the highway equipment maintenance man's greatest headache—*breakdowns.* And, because of its positive, even, powerful action, the Feeder insures a steady flow of material to the distributor or spinner. The spinner, which makes operation possible in traffic without damaging passing vehicles, can be easily and quickly adjusted to provide a spread ranging from 8 feet to 32 feet.

Only one man operates the Fox—The Control Lever that starts and stops flow of material is easily operated by the driver . . . operates effectively at speeds ranging from 5 to 40 miles an hour. You don't need to slow down to stop flow of sanding material.

With the Fox you make use of trucks you already have — can be mounted and ready to operate in 15 minutes. Here's how simply it's done.

1. When not in use, Fox Spreader is stored on a wheeled "dolly."
2. Push "dolly" out under loading crane or hoist—attach lifting yoke to "eyes" which are a part of frame. Hoist and drop in place on truck body.
3. Lock adjustable shafts to tail gate—anchor to sides with built-in hand crank tie rods.
4. Give Wisconsin air-cooled engine a few turns to check—and you're ready to go. It's as simple as that.

Conceived by Practical Maintenance Men—The Fox Mountable sand, chip, salt, calcium chloride spreader is engineered and manufactured by men with 38 years experience building heavy-duty equipment. For more information, prices and complete specifications, see your road machinery dealer. If a dealer has not been appointed in your locality, write, wire or phone collect to *Fox River Tractor Co.,* P.O. Box 469, Appleton, Wisconsin. Phone: Regent 4-1451.

FOR MORE DETAILS ➡

FOX RIVER TRACTOR CO.
APPLETON, WISCONSIN

Fox River Tractor Co., Appleton, Wisconsin

I'm interested in making a substantial saving in our sanding operations. Please send complete literature specifications, and prices on the new Fox Spreader. Dept. R3.

Name_____

Position_____

Address_____

City_____ State_____

TONS OF GOOEY WASTE... but a FORD Tractor-Loader

1.

H. C. Hackett of Williams Bay, Wis., looks over part of the residue drawn from the city's water during his 13 years as superintendent. Every ton of lime used in the water softening system draws off 3 tons of heavy, sticky waste at the settling beds.

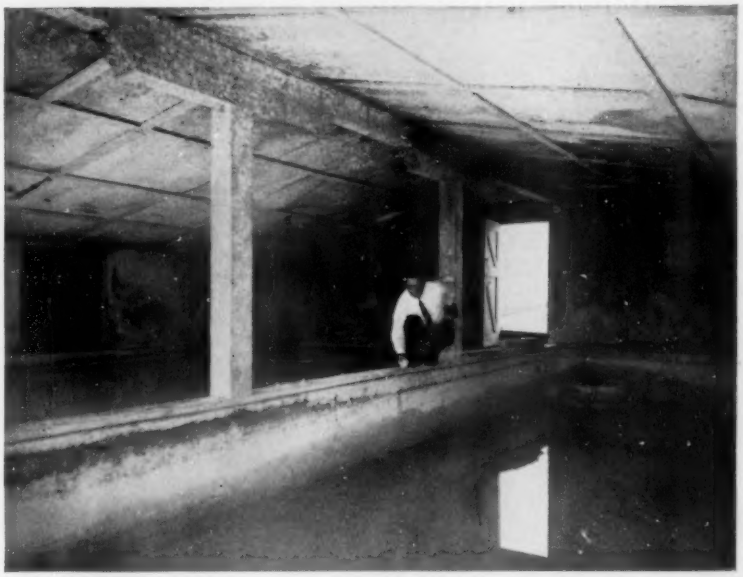
3.

The problem was solved with several strips of plywood and a Ford Tractor-Loader. The compact rig easily moves into the bed through the tiny entry. The unit "floats" over plywood strips laid on the sand as work moves forward. Bucket tilt-back holds each load without crumbling.

Ford
TRACTORS AND INDUSTRIAL EQUIPMENT

You see more

"IMPOSSIBLE" FLOTATION... solved the problem



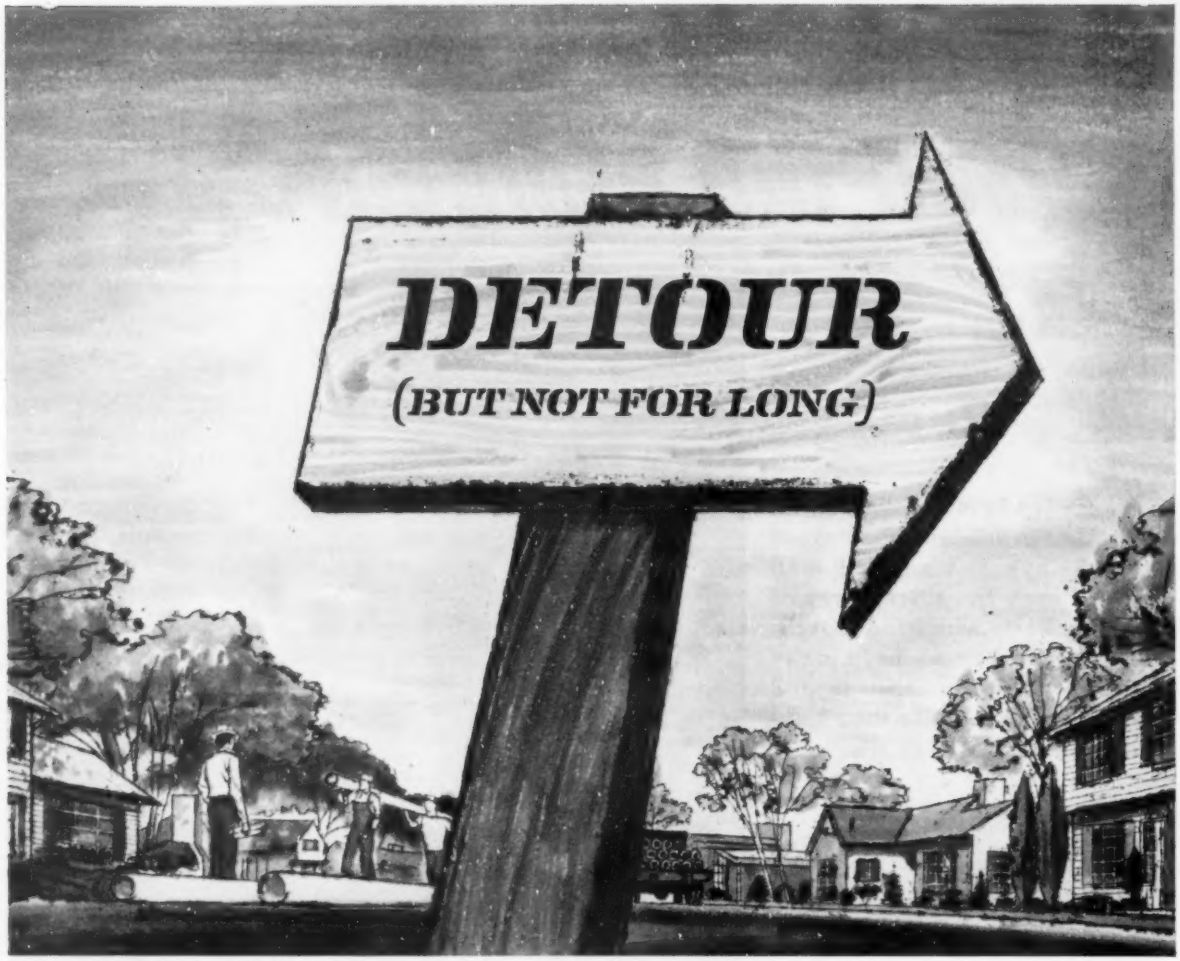
2.

Three sand and gravel filtering beds are worked in rotation, one cleaned every 5 days. For years, 3 men sweated over the thick layer of paste-like waste with hand shovels. Conveyors were no help, only churned the residue into liquid. Tractor-loaders sank to their hubs in the sand.

4.

Just a fraction of the time and man-power formerly spent—and no exhausting hand labor . . . another example of how ingenuity and Ford can be used to whip almost any job problem. How about *yours?* Talk to your dealer or write to: Tractor and Implement Division, Ford Motor Company, Birmingham, Mich.

FORDS *because they save more money!*



Transite Sewer Pipe installs fast . . . to last!

. . . keeps installed costs lower . . . licks infiltration, root clogging

Transite's Ring-Tite Coupling prevents two major sewer line problems. It locks out roots . . . seals out ground water!

Its Ring-Tite Coupling is quickly assembled, provides a tight, long-lasting seal!

IN A SEWER PIPE INSTALLATION, you want a good "tight" system . . . and you want it completed fast! You get both of these advantages as well as long life and operating efficiency with Transite® asbestos-cement Pipe and the Ring-Tite® Coupling.

Why? Because lightweight Transite reduces handling costs, speeds work above and below ground. Quickly-assembled with the Ring-Tite Coupling, Transite Pipe ends are joined easily . . . *surely!* And to give you a tight long-lasting joint, rubber sealing rings in the Ring-Tite Coupling are tightly compressed between sleeve and pipe to lock out roots and overcome infiltration problems.

Another advantage of Transite Sewer Pipe is its smooth interior; its coefficient of flow is n=0.010. This results in substantial savings—lets you use smaller diameter Transite Pipe, or permits laying to flatter grades.

Let us send you booklet TR-165A. Address Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

Johns-Manville

TRANSITE SEWER PIPE WITH THE RING-TITE COUPLING

***NEW UDT-1091**
TURBOTORQUE POWER UNIT
*250 net hp @ 1,500 rpm, 200 Cont. hp @ 1,500 rpm complete with radiator and fan.

New 250 hp *Turbotorque International . . . power cost-cutter for your big machines

Now—lower cost, more dependable power for your big driven machines—the new 250 hp Turbotorque International UDT-1091 power unit. And that's on-the-job shaft horsepower—not the inflated laboratory variety against which big deductions must be made for fan, radiator, accessories, plus altitude and air temperature.

This instantly available 250 hp, along with an extra-large counterbalanced crankshaft and heavy flywheel, carries you through peak loads that stall lighter weight engines. As a result, you can make full use of the continuous duty 200 hp rating for more production at lower cost.

The UDT-1091 has all the features that have made the 200 hp naturally aspirated UD-1091 a favorite diesel power source. In addition, it has a water-cooled oil temperature stabilizer as regular equipment and a radiator with greatly increased cooling capacity. The efficient exhaust-gas-driven AiResearch turbocharger moves 60% more air through the big 14-in. diameter air cleaner. This air is packed into the cylinders for minimum fuel consumption and higher power with lower exhaust gas temperatures.

Get the full story on the new UDT-1091 and the other 17 International high-output engines from your nearby International Power Unit Distributor or Dealer. His parts and service support is as dependable as the engines he sells! Call him soon.

INTERNATIONAL®

International Harvester Company
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CONSTRUCTION EQUIPMENT

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

Now SAVE TIME

USE MUELLER COPPER

WHY USE A METER YOKE?

Because a meter yoke provides a tailor-made setting for your meter with fewer joints and fittings—reduces installation time. New service lines may be completed and backfilled without the meter. Meters are then quickly added—or removed—at anytime without disturbing the piping.

The yoke becomes a permanent part of the piping system and absorbs piping stresses to protect your meter and insure accurate measurement and full revenue. And yokes raise your meters out of the debris and moisture at the bottom of the meter box for easier, more dependable readings and greater accessibility.

Yes, meter yokes give you the ideal setting for all your water meters—inside or outside.

WHY USE A MUELLER COPPER METER YOKE?

Because a Mueller *Copper* Meter Yoke gives you greater flexibility for faster, easier installation—even when service pipe is out of line. And corrosion resistant seamless copper tubing with sweeping curves gives full pipe capacity flow indefinitely with practically no maintenance.

Properly spaced and accurately aligned swivel nuts aid quick meter installation or removal. All swivel nuts are drilled to permit sealing meter.

Special, ribbed body design provides ample strength to absorb piping stresses and prevents drilling through body to by-pass meter.

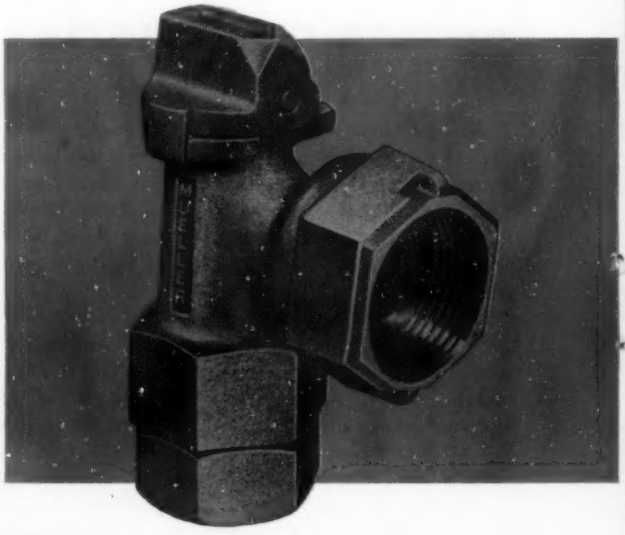
And Mueller's special multi-purpose end connections reduce your inventory! Outside I. P., inside I. P., copper or any combination of these connections may be made by stocking only one type of yoke with additional tailpieces.

Mueller's complete line includes a copper water meter yoke ideally suited to fit your individual needs.

not enough space
for a meter yoke?

USE A MUELLER ANGLE METER STOP!

Mueller Angle Meter Stops give you many of the advantages of copper meter yokes and may be used separately in extremely confined locations. Inside I. P. or copper connections.

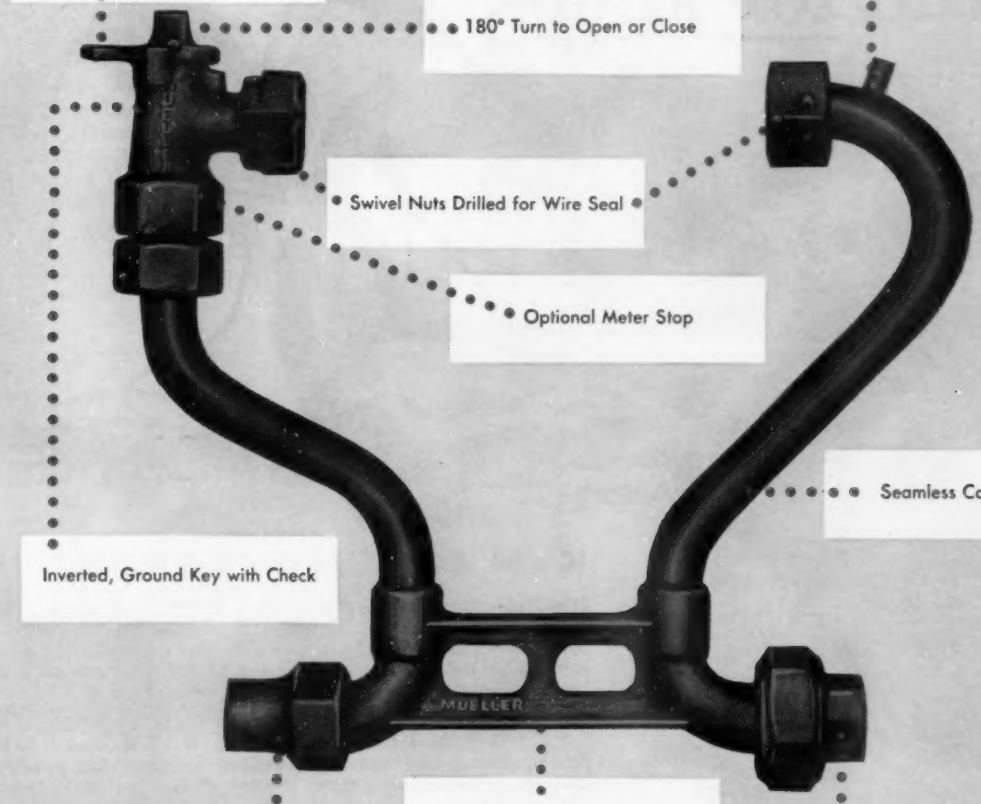


. . . see your Mueller Representative today!

AND MONEY SETTING WATER METERS ...

METER YOKES!

check these time and money saving ***features***



Since 1857

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Into the ground with ease, and for keeps

K&M ASBESTOS CEMENT PIPE

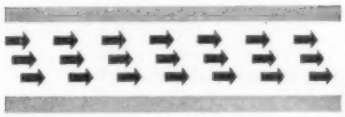
It's the modern pipe! Easy installation under any weather and ground conditions is just one of the advantages of K&M Asbestos-Cement Pipe. Other advantages: Permanently smooth non-tuberculating bore; non-corroding inner and outer surfaces; high resistance to electrolytic action; permanence of joint obtained quickly with exclusive K&M "Fluid-Tite"® Coupling.

K&M Pressure Pipe meets A.W.W.A., A.S.T.M., and U.S. Federal Specifications, and has Underwriters' Laboratories approval for all sizes (pipe and couplings) in Class 150.

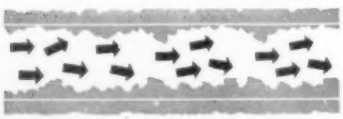
FOR GRAVITY SEWER SYSTEMS, K&M Sewer Pipe is the low-cost answer. "Fluid-Tite" Coupling makes permanent tight joint, prevents infiltration and root entrance.

FOR HOUSE-TO-SEWER CONNECTION, K&M Building Sewer Pipe and 2-step couplings round out the K&M family of asbestos-cement pipe.

Get the whole story on the modern pipe from the K&M distributor.



After many years, K&M Pipe hasn't tuberculated, bore remains unchanged, and full flow continues.



Old-fashioned pipe tuberculates over the years, requires higher pumping pressure, frequent cleaning.

K·M BEST IN ASBESTOS

KEASBEY & MATTISON Company • Ambler, Pennsylvania

In Canada, it's ATLAS ASBESTOS CO., Ltd., 5600 Hochelaga St., Montreal, P.Q.

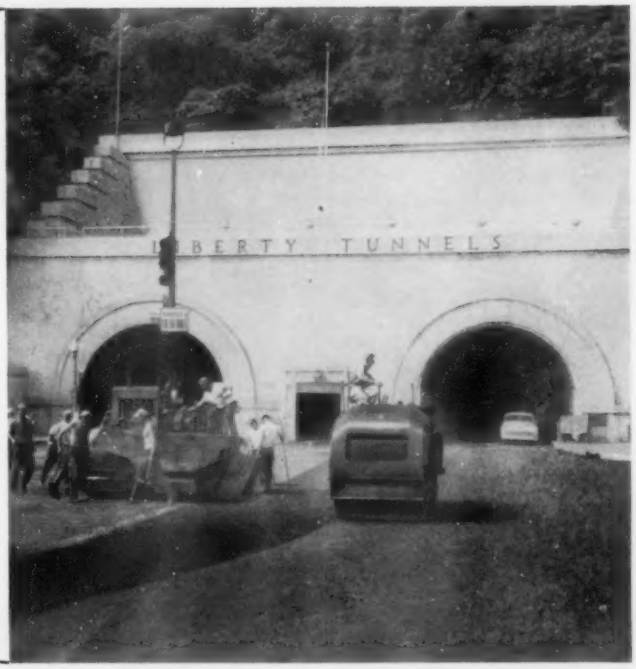
for "CENTURY" Pipe and "FLUID-TITE" Coupling

Nationwide service on Bitumuls & Asphalt for every paving need...all from <u>one</u> source!

PENNSYLVANIA: Laykold® Asphaltic Concrete solves a tough paving problem on the Liberty Bridge, a major approach to downtown Pittsburgh. (When it comes to pavements, bridges are notoriously "bad actors" because expansion and contraction of the deck result in an unusual degree of movement under the surfacing). Based on previous use of Laykold Asphaltic Concrete, Department of Public Work officials for Allegheny County knew that this material retained an extra measure of resilience after placement and compaction, with no decrease in load-bearing value.

Mixed with slag aggregate, a 120 lb. "LAC" binder course and a 100 lb. "LAC" surface course were placed over an area of some 32,000 sq. yds. Trumbull Construction & Asphalt Company of Pittsburgh did the work. American Bitumuls & Asphalt Company supplied the asphalt and the Laykold Tempering Fluid.

Results to date: excellent service; no pavement failures.



CALIFORNIA: Across the nation, on the Pacific Coast, the State of California Department of Highways let a half-million-dollar contract for re-surfacing 41 miles of U. S. Highway 99 to the Schroeder Company, of Sun Valley, California. For this job, American Bitumuls & Asphalt Company supplied: 1,700 tons of Air Refined Asphalt; 3,500 tons of Paving Asphalt; 140,000 gallons of Bitumuls® Emulsified Asphalt.

LOUISIANA: While "down South," on the construction of a road for private industry at Grand Isle, La., American Bitumuls & Asphalt Company supplied Bitumuls Emulsified Asphalt for 20,000 sq. yds. of 3-course surface treatment work on which *clam shells* were used as aggregate. As cover aggregate, shell produces a long-wearing surface.

Whenever . . . and wherever . . . your paving job calls for asphalt or asphaltic products, call our office nearest you. *That's your single source for all your asphalt requirements.*

American Bitumuls & Asphalt Company

200 Bush St., San Francisco 20, Calif. Perth Amboy, N. J.
Baltimore 3, Md. St. Louis 17, Mo. Cincinnati 38, Ohio
Mobile, Ala. San Juan 23, P. R. Tucson, Ariz.
Inglewood, Calif. Oakland 1, Calif. Portland 7, Ore.

Work Bulls pay off

in town, city, county, state, federal service

Work Bulls provide the *right* tractor power with design-integrated attachments — earn an amazingly large return on a small equipment investment.

52 hp **WORK BULL MODEL 404**

(left foreground) Biggest and most powerful Work Bull, this money-maker is powered by either gasoline or diesel engines. Machine shown is equipped with hydraulically controlled backhoe (handles 12 to 36 in. buckets) which swivels through 180°, digs to depth of 12½ ft. Front-end equipment includes ¾ yd. loader, broom, blades, fork lift and snow plow. Same hydraulic arms handle all these attachments. Result: Multiple machine versatility at extremely low cost.

34 hp **WORK BULL MODEL 202**

(left background) Low-silhouette tractor can be equipped with reel, rotary or side-mounted mowers. Other attachments include loader, hoe, post hole digger, pipe and cable layer, utility boom, fork lift, dozing or grading blades and a hydraulically controlled 5-ft. broom.

42 hp **DAVIS PIT BULL**

(right) This low-cost unit frequently outworks much larger, more expensive machines. Torque converter and foot-shift reversing clutches are standard equipment. Unit illustrated is equipped with hydraulically controlled grader blade. Low-thrust principle assures solid "bite," eliminates climbing when the going gets rough. The Davis Pit Bull is available only through M-H-F Work Bull dealers.

. . . as primary equipment

Work Bulls put former hand work on a paying power basis . . . provide far more versatility than other wheeled tractors in their work range. Work Bulls dig, doze, load, lift, grade . . . mow grass, plow snow, sweep roadways. Work Bulls more than earn their keep year round.

. . . as backup machines

With Work Bulls you get the exact power/equipment cost ratio the job demands . . . increase efficiency of equipment scheduling . . . cut down overhead. Work Bulls move from site to site through city traffic or cross-country—without permit troubles, without flatbed and other costs.

. . . as utility or cleanup tools

Low in initial cost, low in upkeep, Work Bulls provide an ideal means of allowing larger, more expensive, single-purpose machines to concentrate on the work they're designed for. Remember, one man, in the field, without special tools can switch any of 20 Work Bull attachments in 5-15 minutes.

Work Bulls have a profitable place on every project. Check to see which of the 5 tractors (34 to 52 hp) and 20 easily interchangeable attachments you need. Write for free 24-pg. catalog and the name of your Work Bull distributor.

M·H·F WORK BULLS

Division of Massey-Harris-Ferguson, Inc.

16-G Quality Avenue **Racine, Wisconsin**

EQUIPMENT and MATERIALS

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PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Bulletin Gives Tips on "Light-Up Celebration"

82. A bulletin designed to aid municipal officials, civic groups and utilities in planning celebrations to mark the installation of new street lighting systems is now available from the General Electric Co., Schenectady 5, N. Y. Bulletin GEA-6462 provides a 5-step plan for organizing an effective light-up celebration. Check the reply card.

Literature on Barber-Greene Wheel Ditcher

97. An attractive 8-page bulletin on the Model 774 wheel ditcher is available from Barber-Greene Co., 400 No. Highland Ave., Aurora, Ill. Features of the ditcher and job pictures are included. Check the reply card.

Trail-O-Patcher Bituminous Mixer

102. Bulletin HH-28 on the Trail-O-Patcher bituminous mixer is available from Littleford Bros., Inc., 453 E. Pearl St., Dept. HH-28, Cincinnati, O. The bulletin gives a presentation of facts and diagrams on the unit and also its operational features. Check the reply card.

SpiroVortex System For Treatment of Domestic Sewage

315. "The Dorr-Oliver SpiroVortex System" is described in Bulletin 7314 from Dorr-Oliver Inc., Barry Place, Stamford, Conn. The bulletin describes the principle of design, operation and advantages of the complete treatment of domestic sewage as well as the equipment units employed in the flowsheet. Installation photographs, a typical plan flow diagram and a list of installations to date are also included. Check the reply card today for your copy.

Weeds Controlled by Using Simazin and Related Compounds

318. General weed control is accomplished by using Simazin and water. For full information on this herbicide and how to use it write Geigy Agricultural Chemicals, Saw Mill River Road, Ardsley, N. Y. Check the reply card today.

Extra-Strength Clay Sewer Pipe

258. The four-page bulletin illustrates pipe trenching conditions which require extra-strength pipe, and contains detailed tables of safe supporting strengths for both extra-strength and standard strength clay pipe. It also lists crushing strength requirements for extra-strength clay pipe and schedules of dimensions for full-diameter and reduced-diameter extra-strength pipe. Check the reply card, or write Clay Sewer Pipe Association, Inc., 311 High-Long Building, 5 East Long St., Columbus 15, Ohio.

Rotary Dryers For Sewage Sludge Treatment

106. A 4-page bulletin describing the Standard-Hersey drying system for treatment of sewage sludge and industrial waste is available from Standard Steel Corp., 5001 S. Boyle, Los Angeles, Calif. Check the reply card for full information on the dryer and the integral parts of the unit.

Automatic Valveless Filter

127. Bulletin describes fully the operation of the Permutit automatic valveless filter. The filter can be used wherever gravity flow is feasible. Check the reply card or write The Permutit Co., 330 West 42nd St., New York 36, N. Y.

Semi-Steel Valve For Water and Sewage

266. A completely revised 43-page bulletin covering the entire Rockwell-Nordstrom semi-steel valve line has been issued by Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa. Drawings and detailed description of Rockwell-Nordstorm lubricants and lubricating methods and cutaway photos showing in detail the working parts of the valves are included. Check the reply card.

Planning A Sanitary Landfill

287. Covered in this manual is how to work various types of terrain efficiently for sanitary landfills. Swampy land, river bottom land, gravel pits, strip mines, and flat land operation are the sections. Write to Caterpillar Tractor Co., Peoria, Ill., or check the reply card for your copy.

Information on Barrier-Beam Guard Rail

294. Design features, engineering data, erection instructions and specifications for USF barrier-beam and Universal-beam guard rails are presented in an illustrated 12-page bulletin released by United Steel Fabricators, Inc., Wooster, O. Check the reply card for data on bridge flooring and steel forms for concrete bridge decks.

Valuable Information on Waterworks Primer and Enamel

303. Corrosion and tuberculation controls for steel work of water supply and distribution projects are covered in this bulletin from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. Specifications and standards are fully included. Check the reply card.

Selecting Concrete Waterstops

150. Polyvinyl plastic waterstops for concrete construction joints are described fully in literature from Water Seals, Inc., 9 S. Clinton St., Chicago 6, Ill. Blueprint type specification drawings and a table that lists the recommended joint application and water head for each size and kind of waterstop are included.

Power Cranes and Excavators

151. General Catalog #156 covers backhoes, clamshells, cranes, draglines, shovels and self-propelled units. Engineering features, pile drivers, power plants and specifications are also included. Check the reply card or write Schield Bantam Co., Waverly, Ia.

Short Coupled Vertical Service Pumps

152. A 6-page, 5-color bulletin describing Layne short coupled vertical service pumps is available from Layne & Bowler, Inc., Memphis 8, Tenn. It explains the many uses of service pumps, including suggested installation plans, existing installations for municipal and private water works systems. Check the reply card.

Trafficones For Positive Traffic Control

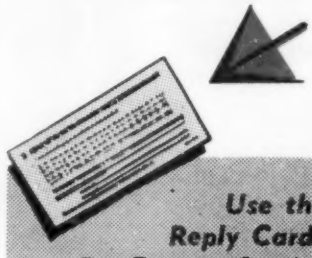
240. Trafficones and adapters for a complete Trafficone System are covered in literature available from Interstate Rubber Products Corp., 908 Avila St., Los Angeles 12, Calif. The cones are made of flexible natural rubber paint guaranteed not to discolor and built to withstand abuse.

Utility Tractor For Construction and Maintenance

232. Bulletin CR-1333-G describes the performance and handling ease of the International 350 utility tractor. Advantages, special features and specifications are included. Check the reply card or write Construction Equipment Div., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Waste Treatment Equipment For Municipalities

243. A general description of Chain Belt Company's line of waste treatment equipment is contained in a bulletin from Chain Belt Co., Milwaukee 1, Wisc. Equipment for large and small sewage or industrial plants is covered.



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American Water Works Ass'n
Durham, N. C., Aug. 19-23

Pennsylvania Sewage and Industrial Wastes Ass'n
University Park, Pa., Aug. 28-30

Wisconsin Section, AWWA
Milwaukee, Wisconsin, Sept. 4-6

New York Section, AWWA
Lake Placid, N. Y., Sept. 11-13

South Dakota Sewage and Industrial Wastes Ass'n
Sioux Falls, S. D., Sept. 11-13

New England Water Works Ass'n
Boston, Mass., Sept. 15-18

International Municipal Signal Ass'n
Miami Beach, Fla., Sept. 16-19

Ohio Section, AWWA
Cincinnati, Ohio, Sept. 18-20

Public Works Congress and Equipment Show
Philadelphia, Pa., Sept. 22-25

Federation of Sewage and Industrial Wastes Ass'n
Santa Fe, New Mexico, Sept. 23

Kentucky-Tennessee Sewage and Industrial Wastes Ass'n
Louisville, Ky., Sept. 23-25

American Water Works Ass'n
Santa Fe, New Mexico, Sept. 24-25

Federation of Sewage and Industrial Wastes Ass'n
Fargo, N. D., Sept. 25-27

Michigan Section, AWWA
Detroit, Michigan, Sept. 25-27

Okla. Sewage and Industrial Wastes Ass'n
Stillwater, Okla., Sept. 25-26

North Central Section, AWWA
Fargo, N. D., Sept. 25-27

American Water Works Ass'n
St. Louis, Mo., Sept. 29-Oct. 1

Federation of Sewage and Industrial Wastes Ass'n
St. Louis, Mo., Sept. 29-Oct. 1

Federation of Sewage and Industrial Wastes Ass'n
Boston, Mass., Oct. 7-10

Sixteenth Annual Short Course on Roadside Development
Columbus, Ohio, Oct. 8-11

American Water Works Ass'n
Oklahoma City, Okla., Oct. 13-16

American Water Works Ass'n
Des Moines, Iowa, Oct. 16-18

American Water Works Ass'n
Biloxi, Miss., Oct. 20-23

American Water Works Ass'n
Wheeling, West Va., Oct. 23-24

American Water Works Ass'n
Atlantic City, N. J., Oct. 24-26

American Public Health Ass'n
Cleveland, Ohio, Nov. 11-15

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247 249 254 257 258 259 266 271 280 281 285 287
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331 341 343 348 351 353 356 361 362 367 369 381
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READER SERVICE is a monthly feature of PUBLIC WORKS Magazine designed to help the reader get all the information needed with the minimum of time and effort. Mail your card today!

End ODOR complaints ...with OZENE!

OZENE is an easy-to-use, fast-acting liquid that has successfully eliminated odor complaints from a wide variety of sources, including sewage, leather and rendering plants, land-fill waste disposal projects, industrial lagoons, dried milk and cheese plants.

OZENE is concentrated—only two quarts of OZENE a day has stopped odors from 450,000 gallons of sewage! It can be diluted as much as 100-to-1 for effective, low-cost spraying.

OZENE works two ways. (1) It masks existing odors. And, in addition (2) it attacks the *cause* of many odors — sulphide-forming bacteria, mold-microorganisms. It also has proved effective in eliminating filter flies . . . cutting slime and grease deposits.

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sewage plants, new excess-capacity sewers; drainage ditches; incinerators; storm sewers; sewer breaks; sludge de-watering; fish-market areas; land-fill refuse disposal; refuse cans and trucks; kennels; rendering plants; cheese, cannery and other food plants; etc.

Find out how OZENE can aid you!

Allied Chemical

SOLVAY PROCESS DIVISION
ALLIED CHEMICAL & DYE CORPORATION
61 Broadway, New York 6, N. Y.

Gentlemen:

- ☐ The accompanying letter states my odor control problem. What's your recommendation?

Please send me without cost:

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Compounds • Ortho-dichlorobenzene • Para-dichlorobenzene
Methyl Chloride • Carbon Tetrachloride

SOLVAY ®

To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

Explosives Fact Manual
By Atlas Powder

132. Facts and figures to help users of explosives, as well as descriptions of the complete line of explosives products, are included in this 48-page manual published by Explosives Div., Atlas Powder Co., Wilmington, 99, Del. Containing more than a score of tables and over 100 illustrations, the book provides specific assistance in the selection of explosives. Check the reply card.

Plastic Base Sewer
Pipe Jointing Compound

160. This catalog describes Root-Seal which is a hot pour plastic base sewer pipe jointing compound for clay and concrete sewer pipe. Check the reply card or write K. T. Snyder Co., P. O. Box 14233, Houston 21, Tex., for complete information on this jointing compound.

Water Coolers, Wall
Fountains and Water Purifiers

234. This comprehensive 24-page catalog covers the complete range of Filtrine water coolers—concealed, remote and cabinet models—stainless steel and stainless steel on china drinking fountains and water filter-purifiers. All models are fully illustrated with half-tones and line installation drawings. Write for Catalog 57a to Filtrine Mfg. Co., 122 West Prospect St., Waldwick, N. J., or check the reply card.

Electronic Supervisory Control
Systems for Water and Sewage Works

307. How measurements can be made, irregularities in performance can be detected, and units of a water or sewerage system can be operated from a centrally located panel are described in a 10-page bulletin illustrated with typical installation diagrams, issued by Sparton Control Systems Div., Sparton Corp., Jackson, Mich. Check the reply card.

Swimming Pool
Supplies and Equipment

60. Chemicals, purifying equipment, chlorinating equipment, paints, water testing and locker room equipment are a few of the sections covered in this 28-page catalog. Check the reply card or write Halogen Supply Co., Inc., 4653 W. Lawrence Ave., Chicago 30, Ill.

America's Water Needs —
Their Investment Significance

186. The shape and size of a long-range construction program to meet the country's expanding requirements for water are the subjects of a 19-page catalog available from Dominick & Dominick, 14 Wall St., New York 5, N. Y., investment banking and brokerage firm. Check the reply card today.

Complete Valve and
Remote Control System

199. This S. Morgan Smith valve and controls are designed to satisfy precise positioning and indication and where you need remote control. The system can be used in sump level control, effluent and flow control, and filter water influent level control. Check the reply card or write S. Morgan Smith, York, Pa., for Catalog 164.

Bulletin on Hydraulic
Highway Mowers

254. Features and specifications on the Anderson hydraulic highway mower are covered in literature from A. C. Anderson, Inc., Wildwood, N. J. These mowers are available for right side, left side, or both sides installation. Check the reply card.

Plan Hold
Vertical Filing Equipment

259. Plan Hold is designed to hold building or engineering prints in any available rack or plan file without the necessity of punching or drilling holes or mutilating the plans in any way. For types of files and price list write Plan Hold Corp., South Gate, Calif., or check the reply card.

Improve Floc Formation in
Clarifying and Softening Water

192. Water clarification with coagulants is described in bulletin available from Hagan Chemicals & Controls, Inc., Hagan Building, Pittsburgh 30, Pa. The Hagan coagulant aids are covered as well as the typical experiences of these coagulant aid users. Check the reply card.

Repair Water Lines With
Adams Broken-Pipe Clamp

257. Adams BPC is used for repairing complete breaks in cast iron or asbestos-cement pipe. The clamps are stainless steel bands with neoprene gaskets and fit pipe up to 36 ins. in diameter. For price list and specifications write Adams Pipe Repair Products, 2453 Merced Ave., P. O. Box 111, El Monte, Calif., or check the reply card.

Progress Through
Photogrammetry and Geophysics

280. This illustrated catalog covers aerial photography, photographic maps, topographic maps, airborne geophysical surveys and worldwide surveys. Write Hycon Aerial Surveys, Inc., 1020-30 S. Arroyo Parkway, Pasadena, Calif., or check the reply card for information on highway or municipal topographic mapping.

Waste Receptacles
For Cleaner Streets

323. A complete catalog on the Bennett waste receptacle is available from The Bennett Manufacturing Co., Alden, N.Y. Eye catching stenciled messages on 1, 2, 3, or 4 sides invite people to keep the streets clean. The receptacles are made of heavy gauge steel, molded joints, stainless steel feet and baked on enamel finish. Check the reply card today.

Electric
Generator Plants

325. Mobile electric generating plants that provide an output of 2300 watts, 115 volts AC are described in literature available from Pioneer Gen-E-Motor Corp., 5841 West Dickens Ave., Chicago 39, Ill. Weigh 200 lbs. and can be mounted on rubber tires or steel skids.

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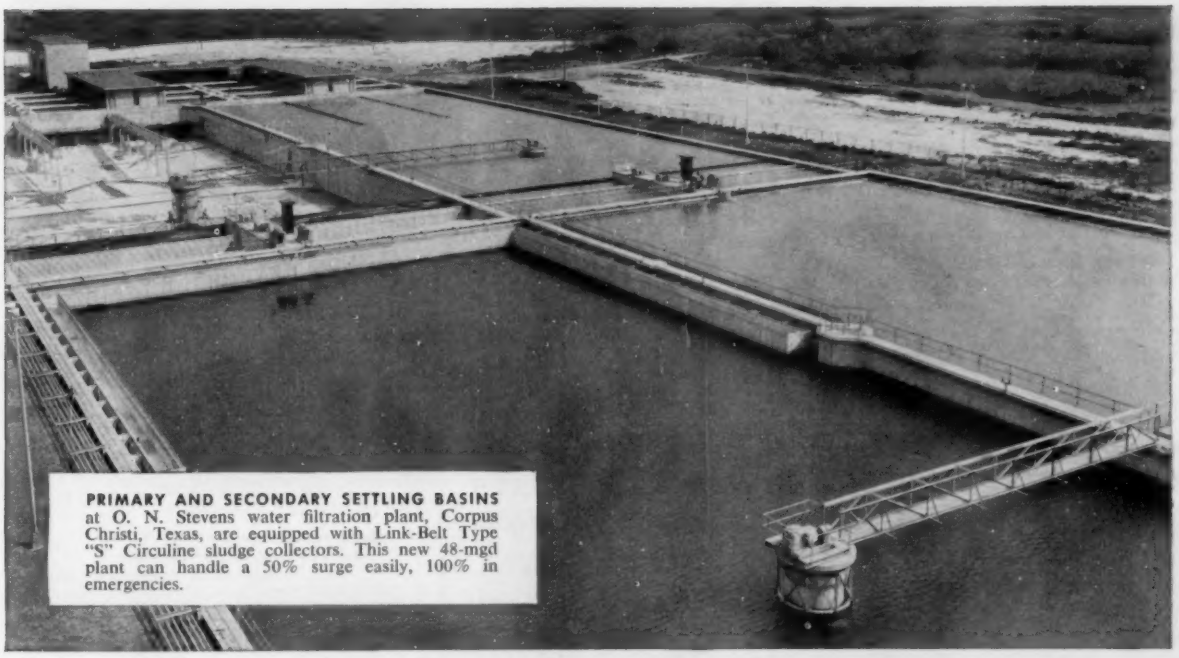
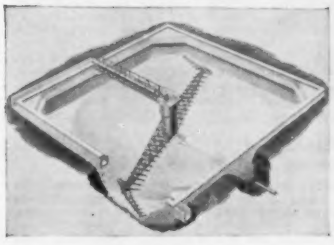


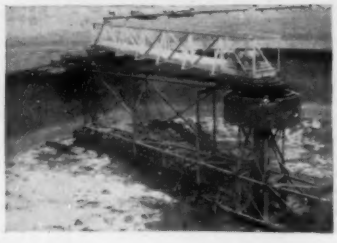
PRIMARY AND SECONDARY SETTLING BASINS at O. N. Stevens water filtration plant, Corpus Christi, Texas, are equipped with Link-Belt Type "S" Circuline sludge collectors. This new 48-mgd plant can handle a 50% surge easily, 100% in emergencies.

Four types of LINK-BELT Circuline collectors

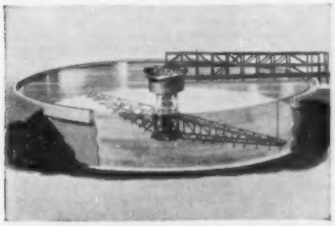
offer positive sludge removal



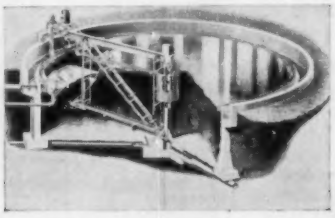
TYPE "S" — specially designed for square and rectangular tanks. As collector revolves, pivoted arms on ends of rakes adjust to thoroughly remove sludge from basin corners.



TYPE "R" — available in models for bottom feed, side feed or cross flow applications . . . in a wide range of sizes. Pitched blades gently convey sludge to center of tank.



TYPE "T" THICKENER — for rugged duty. Similar to "R" collectors except for heavier design. Furnished with fixed rake and automatic or manual lift types.



TYPE "C" — uses simple, positive traction drive to rotate bridge. Slow-speed straightline collector, with long-wearing, corrosion-resistant chains, removes sludge.

There's a design to fit any requirement of tank capacity or construction

THERE's no problem of septicity in settling tanks where Link-Belt Circuline collectors are used. Traveling smoothly and gently, they assure minimum disturbance of flow and the greatest possible concentration and removal of solids in least time.

This efficiency is typical of all the equipment in the complete Link-Belt line for water, sewage and industrial liquids treatment. And it testifies to the value of Link-Belt's more than 35 years' experience in sanitary engineering.

Link-Belt will gladly work with your consultants and chemists on *any* treatment problem. Call your nearby Link-Belt office.

LINK-BELT

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To order these helpful booklets check the reply card opposite page 34.

WATER WORKS

Waterstops For Expansion and Construction Joints

19. A polyvinylchloride waterstop "Durajoint", that is resistant to extreme waterhead pressures, tensile strength of not less than 1900 psi, chemically inert and available in easy to handle 50 ft. coils is described fully in literature from Durajoint Technical Information Center, 121 Hill Ave., Aurora, Illinois.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, colorimeters and similar devices. A 100-page booklet is available by checking reply card W. T. Taylor Co., 7304 York Road, Baltimore 4, Md.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American Water meters described in Bulletin No. 56 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Check the reply card.

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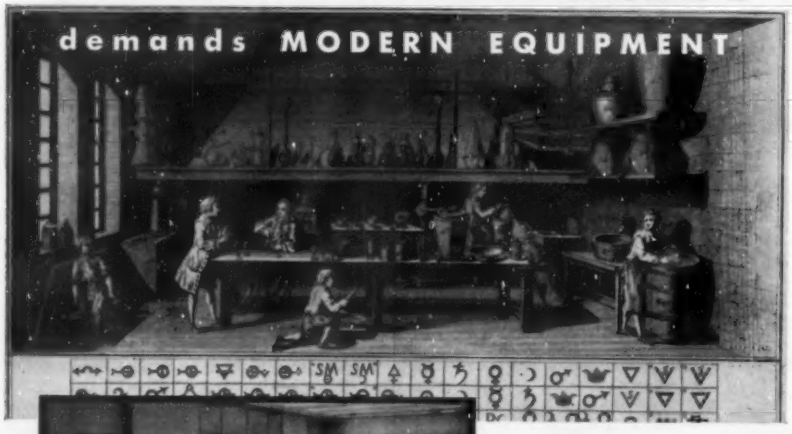
demands MODERN EQUIPMENT



The authentic engraving shown in this advertisement is typical of a chemistry laboratory in France in the late 1700's. For your free copy (11" x 15") of this reproduction, write on your company letterhead stating your name and title.

This is a modern Metalab installation at Armstrong Cork Company, Lancaster, Pa.

YOUR LABORATORY SHOULD PROVIDE FOR EXPANSION!

The equipment used in the 18th century laboratory was adequate for its period. Today's laboratories must use superior equipment in order to achieve the high quality performance standard which is expected of them.

Metalab laboratory equipment is made to exceed these standards, and to insure maximum adaptability for future progress. Let our Engineering Service plan your laboratory needs in order to realize an economical laboratory installation with the finest equipment.

Our line is complete and includes such equipment as: Center Tables, Fume Hoods, Storage Cabinets, Nuclear Equipment, Sink Units, Specialized Laboratory Equipment, etc.

For information and catalogs on the complete METALAB line of equipment, write to Dept. T. They will be sent to you promptly without obligation.

METALAB Equipment Company

238 Duffy Ave., Hicksville, L. I., New York

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher, pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 5415, Shepard Station, Columbus 19, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the reply card to get your copy.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the reply card for full information including table of filter sizes and capacities, space required and filter operation.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Purification of Swimming Pool Water

153. An up-to-date 64-page manual on purification of swimming pool waters presents a comprehensive discussion of daily requirements, chlorine residuals and feeding methods for hypochlorites and HTH tablets. Available from Industrial Chemicals Div., Olin Mathieson Chemical Corp., Baltimore 3, Md. by checking the reply card.

Lay Water Mains Faster With 'Fluid-Tite" Couplings

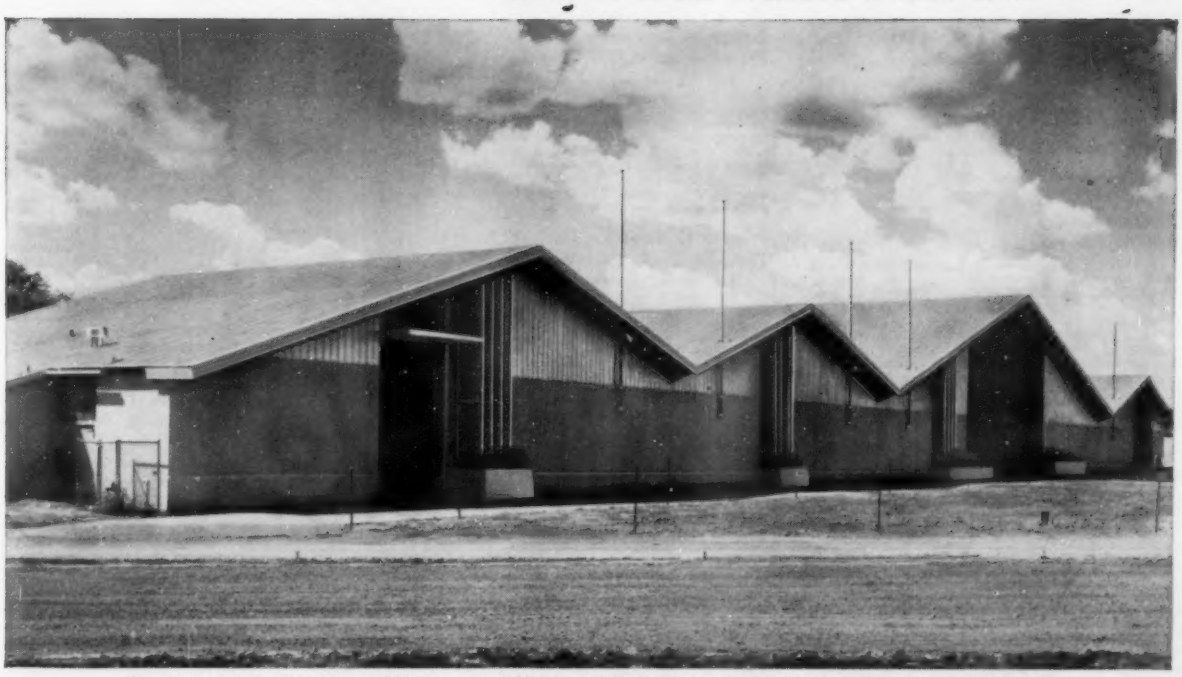
184. Get permanent water-tight joints automatically with Century "Fluid-Tite" couplings for Century asbestos-cement pressure pipe. Full details on this faster installation and self-energizing couplings are available from Keasbey & Mattison Co., Ambler, Penna. or by checking the reply card.

Complete Catalog and Reference Data on Valves and Fittings

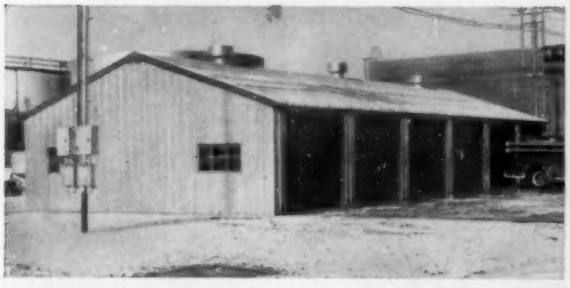
211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 3403 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the reply card for your copy.



State Fair Agricultural building at Oklahoma City, Oklahoma. Walls combine Butler metal panels with conventional materials.



Solid bank of doors provides easy entrance to this Butler fire truck garage.

Butler rigid frame provides spacious interiors free of posts and gable braces.

Impressive or simple... here's the lowest cost way to build well

Tight budget or not, your problem is still how to get the most from each construction dollar. This is true whether your community needs an impressive public showplace or a simple garage.

The Butler buildings pictured above answer this problem because they represent the lowest cost way to *build well.* They all have pre-engineered rigid frames and lifetime metal roofs. Since rigid frames support these buildings, slim, curtain walls went up quickly and economically, even though one used conventional materials and the others used Butler metal panels.

For the full story on how Butler's economical method of construction can help you help your community get the most for its construction dollar, phone your Butler Builder. He's listed under "Buildings" or "Steel Buildings" in the Yellow Pages of your phone book. Or write direct.

BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY

7321 East 13th Street, Kansas City 26, Missouri

Manufacturers of Buildings • Oil Equipment • Farm Equipment • Dry Cleaners Equipment • Outdoor Advertising Equipment • Custom Fabrication

Sales offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Atlanta, Ga. • Minneapolis, Minn. • Chicago, Ill. • Detroit, Mich. • Cleveland, Ohio New York City and Syracuse, N.Y. • Washington, D.C. • Burlington, Ontario, Canada

To order these helpful booklets check the reply card opposite page 34.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installation from 50,000-gal. to 10,000,000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the reply card to get your copy.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the reply card for your free copy.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Auxiliary Electric Power For Public Utilities

249. Full descriptive information on Onan electric plants for every public utility need will be found in bulletin A-292 issued by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. Be sure you have latest data on standby plants and controls for emergency electric power.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P.W., Chicago 5, Ill.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Division, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin F-552 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Factors to Consider in Elevated Tank Selection

299. Details on the several different types of elevated steel tanks, including capacity ranges, tank dimensions and other factors to be considered in the selection of elevated tanks for modern water storage, plus discussions of new tanks for old towers and foundations are included in Bulletin 101 of the Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa. Check reply card for your copy.

For Prompt Service Use The Reply Card

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 1246 from Norton Co., Worcester 6, Mass. by checking the reply card.

Water Treatment For the Small Municipality

348. This bulletin is of special interest to the engineers of small municipalities. A review of the problem of municipal water supply is discussed along with the designs of a water treatment plant and the conventional treatment methods. For your copy write General Filter Co., Ames, Ia., or check the handy reply card.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the reply card.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

Valuable Information On Prestressed Concrete Tanks

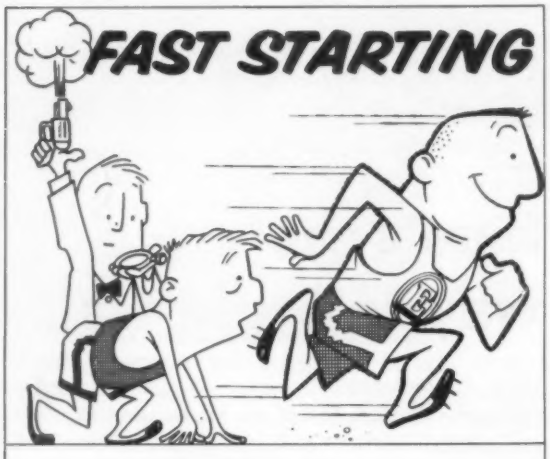
356. This helpful booklet describes the design uses and advantages of prestressed concrete in all types of storage tanks. Plenty of charts, diagrams and illustrations are included. Get yours from The Preload Company, 211 East 37th St., New York 16, N. Y., or check reply card.

Roll-On Joint Pipe For Water, Sewage or Other Liquids

388. American Roll-on Joint Pipe that is centrifugally cast in sand-lined molds for water, sewage or other liquids is described completely in catalog just released by American Cast Iron Pipe Co., Birmingham, Alabama. Applications, specifications, design, class, assembly and disassembly are included. Check the reply card.

Portable, Standby Or Continuous Power

440. Generators and power plants for emergency, portable continuous power are described fully in literature available from Katolight Corporation, Box 89-107, Mankato, Minnesota. Information on motor generator sets, high frequency changers and independent generators up to 400 K. W. is included. Check the reply card today.



Power now
when you need it with
ENTERPRISE
dependable engines

ENTERPRISE ENGINE & MACHINERY CO.
18th and Florida Sts., San Francisco 10
Sales and Service in Principal Cities

STEEL PIPE

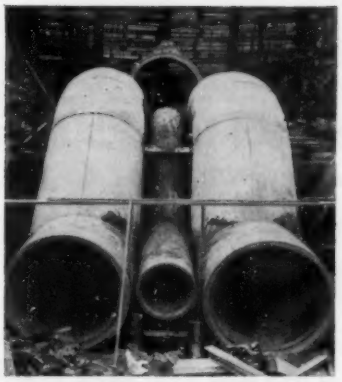
Manufactured in new, modern, continuous mills to exceed specification ASTM-A139-55 Grade B. Available with belled ends, plain or asphalt coated. Butt welded using inert gas, electric welding processes. Pressure tested. Ideal for use in petroleum, gas, and water systems, as well as for irrigation, heat exchangers, well casing and other farm and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾" diameters: 10, 12, 14 and 16 gauge; 20, 30 or 40 ft. standard lengths, or can be produced in any odd size desired.

Available for immediate delivery.

VALLEY Manufacturing Company Valley, Nebraska

Write or call for full specification and production data to: **Steel Pipe Division**



Something special for Chicago....

A-M CONCRETE PIPE SPECIALTIES

Now nearing completion, the Congress Street Expressway extends west for about eight miles from downtown Chicago. Since most of the expressway is depressed below existing north-south streets, inverted siphons were required to supplement an existing and relocated 78-inch diameter combination sewer.

Two lines of 54-inch and one line of 24-inch diameter were constructed of reinforced concrete pipe in 12-foot lengths for the Cook County Highway Department. The smaller line will convey normal dry weather flow. During prolonged rainfall, when the existing 78-inch diameter sewer may flow full or under slight pressure, the two large pipe lines will also carry sewage under the expressway.

The reinforced concrete pipe and the Y-branches and bends were made to exact dimensions and the joints sealed with rubber gaskets by the American-Marietta Company.

Our technical staff will be pleased to assist you with your pipe problems.

Another example of PROGRESS IN CONCRETE

AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION
GENERAL OFFICES:
AMERICAN-MARIETTA BUILDING
101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600

To order these helpful booklets check the reply card opposite page 34.

Here's Help for Laboratory Planning

369. A comprehensive laboratory planning guide that tells the engineer and designer how to obtain maximum space economy; utilize new and present facilities; and use functional design in locating utilities, ventilation and lighting is now available from Metalab Equipment Co., Hicksville, L. I., N. Y. Complete data includes sectional and interchangeable lab equipment, furniture and accessories. Check the reply card for this valuable planning aid.

Bulletin On Locating Trouble in Pumps

533. A bulletin to help locate and correct common ailments of rotary, centrifugal and steam pumps has been released by Worthington Corp., Merchandising Sales Dept., Harrison, N. J. Pictures give a full description of pump troubles—from failure to deliver water to the loss of capacity after starting.

What You Should Know About Venturi Tubes and Nozzles

400. A comprehesive bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications has been issued by Simplex Valve & Meter Company, Lancaster, Pa. Data on advantages, construction and installation details, range of sizes and specifications are given in simplified form. Check the coupon today for your copy.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

Complete Catalog and Reference Data on Valves and Fittings

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

Air Control Valves For All Types of Pipelines

620. Literature on air valves, air and vacuum valves and pressure air valves is available from Multiplex Mfg. Co., Dept. C, Berwick, Pa. Check the reply card for complete information on air valves that keep your pipelines open for safe, economical operation.

Rate Yourself as a

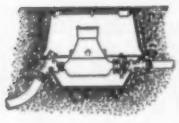
METERologist...

CHECK HERE

- ☐ Do you believe in setting water meters so that they are most available for quick and easy reading?
- ☐ Do you provide installations which put meters in the proper position and protect them from dirt and damage?
- ☐ Are your meters connected into the line so that changing can be quick and trouble-free?
- ☐ Do you test meters periodically and maintain them for maximum accuracy?

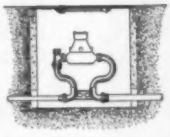
If you have checked all four you probably use Ford equipment. Don't be discouraged if your grade is off a little; the easy first step toward improving it is to send for a FORD CATALOG. IT'S FREE.

These Ford Products Make it Easy for you to be a METERologist



YOKE BOX

For shallow services the Yokebox provides protection to keep meter clean, easy to read and easy to change.

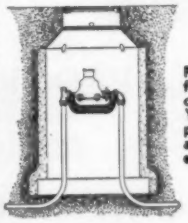


COPPERSETTER

A complete meter mounting that brings the meter up for easy reading and changing. Holds service line permanently connected.

COPPERHORN

Ideal setting for most basements with vertical service lines. Often saves more than its cost in pipe fittings.



DOUBLE LID SETTING

Provides maximum frost protection in cold climates. The Yoke holds risers permanently braced and connected for easy meter changing.

FORD — FOR BETTER WATER SERVICES

THE FORD METER BOX COMPANY, INC. Wabash, Indiana

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Engineering Data on Screening Equipment

77. Water, sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the reply card.

Mechanical Joint Principle Applied to Sewer Pipe

101. The Amvit joint forms a tight compression seal between bell and spigot rings, prevents infiltration and stops root intrusion. Get data on Amvit jointed vitrified clay pipe from American Vitrified Products Co., Cleveland, Ohio. Check the reply card.

Stop Sewage Plant Odor Complaints

137. Effective odor control for sewage treatment plants by use of "Ozene" is described in literature of Solvay Process Div., Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y. Low cost, convenience and safety are important features.

Sewer Design Flow Chart Based on Manning Formula

154. A large-scale, convenient flow chart based on the Manning formula, together with typical examples of use, is available from Johns-Manville, 22 East 40th St., New York 16, N. Y. To get your copy check the reply card or write to the manufacturer and ask for Bulletin TR-94A.

Pipe Joint Essentials and Couplings for Every Job

168. Superior pipe joints are tight, flexible, simple, strong and economical. Dresser's handsome 34-page bulletin No. 513 shows how these essentials are met and provides layouts for curves, working pressures and a wealth of other data. Be sure to check this bulletin on the coupon. Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Submersible Pumps For Municipal Use

185. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

In CANTON, OHIO*

TYLOX

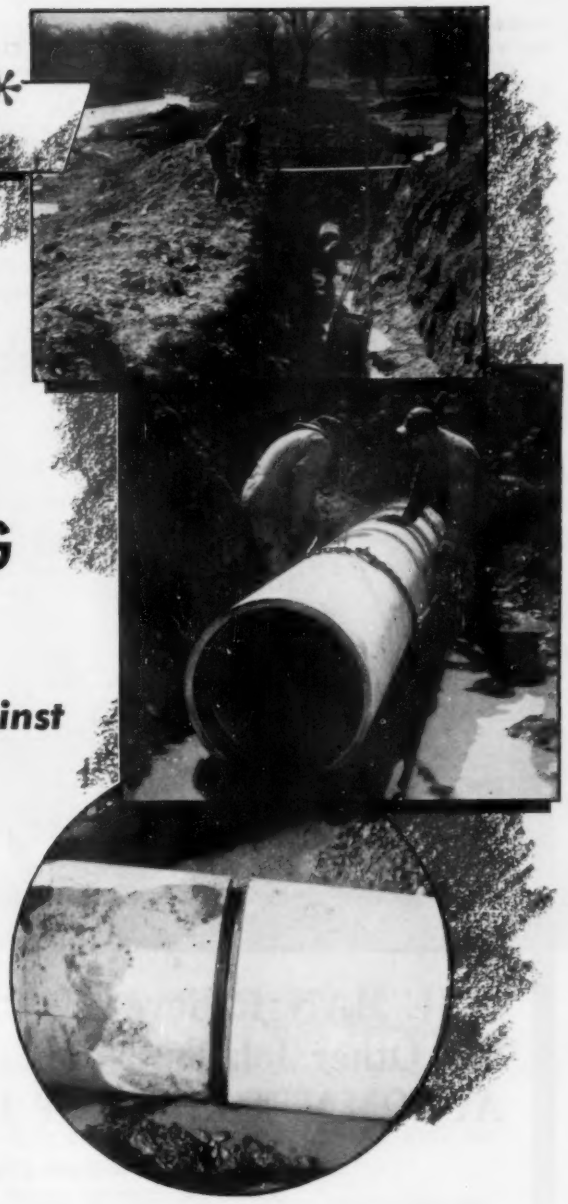
RUBBER PIPE JOINTS

and

REXON PIPE COATING

"team up"

to prevent leaks and guard against corrosion of new city sewers



Engineers had their eyes on future as well as present costs when they designed Canton's recent sewer expansion project. Here's how their call for TYLOX-jointed, REXON-coated concrete pipe helps assure Canton citizens of "most for the money" from their tax dollar . . .

NO JOINT LEAKS — even under tough conditions like those shown in the top photo. TYLOX prevents infiltration . . . keeps treatment plant loads at a minimum . . . eliminates root and sediment penetration.

NO ACID ATTACK — even though industrial wastes may enter the line. REXON Coating (center photo) is resistant to virtually all acids, alkalies, greases and solvents. "Teamed up" with equally durable TYLOX Joints, the resulting line is corrosion-resistant *throughout*.

FAST PIPE-LAYING — Just shove gasketed pipe home (lower photo) and the TYLOX Joint is complete. Wet trenches do not delay the work, and the *flexible* TYLOX permits immediate backfilling.

* **PROJECT:** Stark County sewer expansion project, Canton, Ohio
ENGINEER: A. T. Holl, Stark County Sanitary Engineer
CONTRACTOR: Shullo Construction Co., Akron, Ohio
PIPE: Reinforced concrete, TYLOX-Jointed and REXON Coated, manufactured by United States Concrete Pipe Company, Cleveland, Ohio.

5062

Plan now to specify TYLOX Rubber Joints and REXON Pipe Coating on your next concrete pipe job and be assured of leakproof, corrosion-resistant lines laid faster . . . Write for more details today.

HAMILTON KENT
MANUFACTURING COMPANY
KENT, OHIO
427 West Grant St. ORchard 3-9555

To order these helpful booklets check the reply card opposite page 34.

V-Notch Chlorinators For Water and Sewage Plants

590. Bulletins on the Series A-711 and the Series A-712 chlorinators are available from Wallace & Tiernan Inc., Box 178, Newark, N. J. Covered in the literature are design features that include operation, installation and maintenance. Simplified flow diagrams in color are included showing the operation of the units. Class, capacities, feed ranges and electrical requirements are described in the technical data section. For your copies, check the reply card.

Weir and Flume Meters For Water, Sewage and Industrial Wastes

612. An illustrated 8-page catalog, published by Penn Instruments, Div. of Burgess Manning Co., 1004 Haverford Ave., Philadelphia 4, Pa., describes fully transmission meters, indicating and non-indicating transmitters. It also covers new and novel metering arrangements which have not heretofore been generally used in water and sewage plant installations. Check the reply card.

Champion Power Sewer Cleaners

619. Literature from Champion Corp., 4718 Sheffield Ave., Hammond, Ind. describes the Model C8-23R6 power sewer cleaner. Features include simplicity of operation, folding arch double pinned to allow lowering to either side or removal, safety features for operators and two speeds. Check the reply card.

Use The Reply Card

Biosorption Activated Sludge Plant

654. The "Biosorption" plant treats sewage and industrial wastes by a high rate activated sludge process. Flow diagrams, equipment and design of plants are covered in bulletin from Infilco Inc., Tucson, Ariz. Check the reply card.

Manual on Sewer Structures

178. This is a 48-page manual on installation design, reference data and graphs showing discharge of pipe based on Manning's formulas. Also such subjects as structural durability, material durability; selection of structures; factors influencing capacity; joints and fittings; and linings for failing sewers are covered. Copies of Manual CMS-7456 are available from the Product Information Service, Armco Drainage & Metal Products, Inc., Middletown, Ohio, or by checking the reply card.

Engineering Data Manual on Underground Lift Stations

218. This manual includes descriptive bulletins, specifications covering typical installations for pump type or ejector type stations, friction loss tables covering capacities and size of pipe, pump and motor selection charts and wiring diagrams. Check the reply card or write Smith & Loveless, Inc., Water and Sewage Equipment, P. O. Box 8884, Kansas City, Mo., for your copy.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy reply card or write Combustion Engineering Inc., Raymond Div., 1315 No. Branch St., Chicago, Illinois.

Heavy Duty Raw Sewage and Sludge Pumps

317. The SP-5 raw sewage and sludge pump is designed to operate at heavy duty, high head application and is particularly adapted for pumping sewage or sludge over long distances. Bulletin 198, describing the SP-5, may be obtained from the Chicago Pump Co., 422 Diversey Parkway, Chicago 14, Ill. Check the reply card.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

How to Choose the Right Self-Priming Centrifugal Pump

427. Descriptive folders on the complete line of contractors' pumps have been issued by the Gorman-Rupp Co., Mansfield, Ohio. 2-in. to 10-in models are illustrated, performance tables are shown and pump selection tables are included to assist in choosing the proper pump for different jobs. Check reply card for your copies.

Catalogs on Horizontal and Industrial Service Pumps

477. Pump capacities, heads and horsepowers are fully described in Catalogs B-505 and B-1300 available from Peerless Pump Div., Food Machinery and Chemical Corp., 301 West Avenue 26, Los Angeles 31, Calif. For this information on how these horizontal and industrial service pumps can help you, check the reply card.

ONE-MAN Relieved For Other Jobs by New AUTOMATIC BUCKET DUMPER

To get the full Automatic Bucket Dumper story, write for name of your nearest "Flexible" Distributor.

It's like having an extra man in your Sewer Department *at no extra cost.* The "Flexible" Bucket Dumper is a simple mechanical device that automatically does the job of the man *formerly required* to stand by the manhole and dump the bucket each time it came out of the sewer.

Costing less than 3 weeks wages, it can be installed in 30 minutes on all existing "Flexible" Bucket Machines. And, of course, you should get the facts before buying new machines.

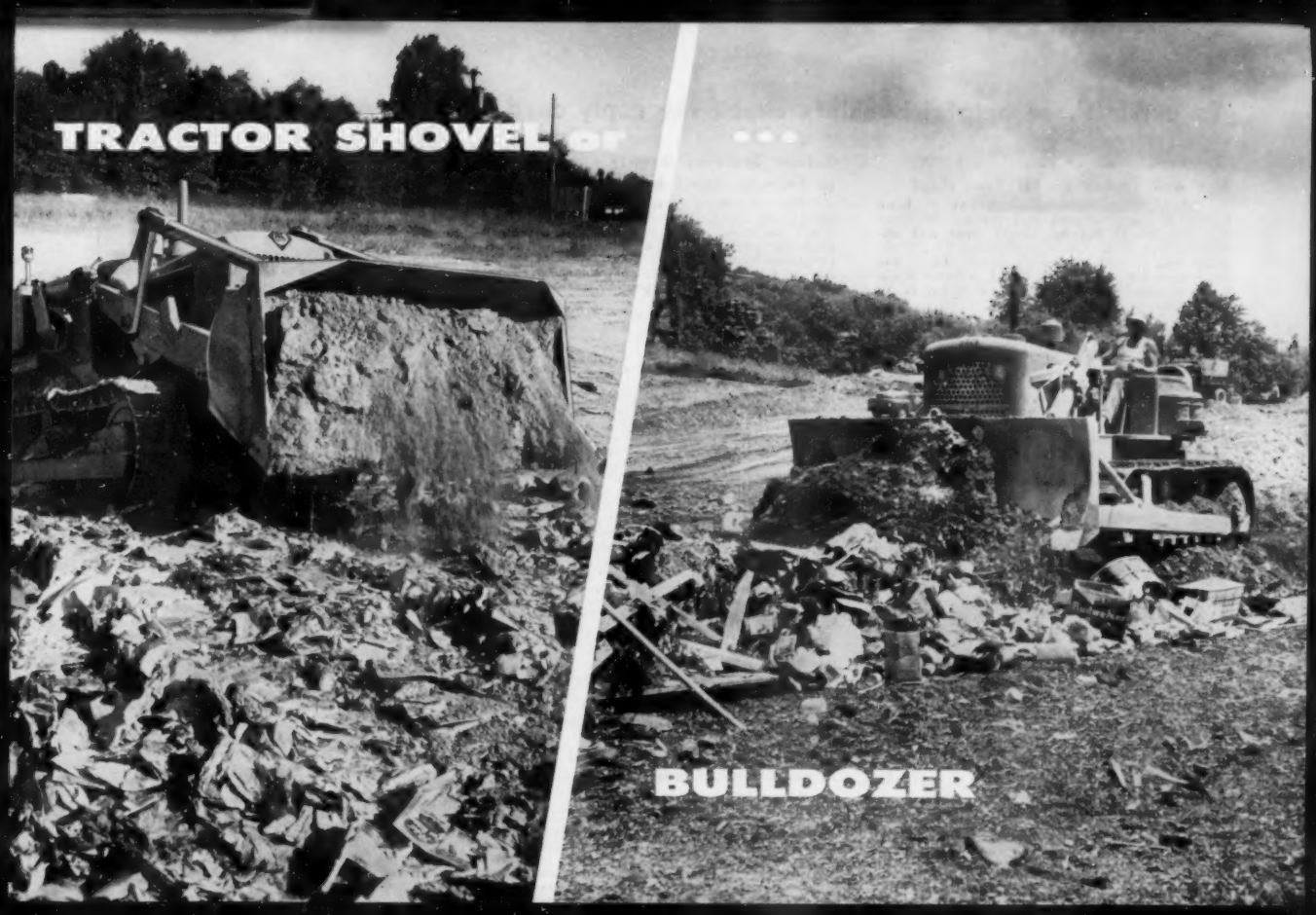
(Distributors in Principal Cities)

FLEXIBLE INC.
3786 Durango Ave., Los Angeles 34, Calif.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications ad aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 20, Calif.



MAKE ALLIS-CHALMERS YOUR CHOICE *for Sanitary Landfill*

There's an Allis-Chalmers tractor shovel or tractor-dozer combination to handle any size or type of landfill job.

In tractor shovels, Allis-Chalmers offers a complete line from 1½- to 4-yd capacity. Each unit handles the complete landfill cycle—digs, spreads, compacts, covers. Each gives you heavy-duty construction with hydraulics to match.

Allis-Chalmers also offers a complete range of bulldozer and crawler combinations for landfill work. Hydraulic or cable-controlled units, straight or angle blade, are close-mounted for better balance, greater efficiency.

Other Allis-Chalmers landfill equipment includes motor scrapers and pull-type scrapers for low-cost hauling of cover material. Versatile motor graders are also available for work on haul roads or for fill maintenance.

Talk to your Allis-Chalmers construction machinery dealer about your landfill requirements. He's ready to show you with facts and figures which unit from the complete Allis-Chalmers line will be best for you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS TRACTOR SHOVEL LINE

Model	Hp	Approx. Wt, lb	Cap., yd
HD-6G	72 net	19,600	1½
HD-11G	111 net	32,000	2¼
HD-16G	150* net	47,800	3
HD-21G	204* net	66,500	4

ALLIS-CHALMERS BULLDOZER LINE

Model	Hp	Approx. Wt, lb hydraulic	Approx. Wt, lb cable
HD-6	63 belt	15,250	—
HD-11	94 belt	24,800	24,300
HD-16	141 belt 150 net*	36,200 36,300	36,500 36,600
HD-21	204 net*	51,400	50,600

*Hydraulic torque converter drive

ALLIS-CHALMERS *Engineering in Action*

To order these helpful booklets check the reply card opposite page 34.

Tractor-Shovels of Any Size and Bucket To Fit Your Need

21. Literature is available on 7 basic models of tractor-shovels that are gas or diesel powered, 44 to 165 hp., front, rear and all-wheel drive from Clark Equipment Co., Pipestone Rd., Benton Harbor 43, Mich. Check the reply card for information on 35 different buckets and attachments ranging from 6 cu. ft. to 5 cu. yds.

Crawler Tractor Shovels and Pull-Type Scrapers

55. Literature is available from Allis-Chalmers on their HD-11G and HD-6G diesel powered crawler tractor shovels and their four pull-type scrapers. Attachments for the tractor shovels are included along with views of each scraper model, and illustrations of the design features of the scraper line. Check the reply card or write Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

What Should You Look For In a Power Sweeper?

206. Helpful information to aid you in the selection of a power sweeper to fit your needs is provided in Bulletin 85.2, issued by G. H. Tennant Co., 755 No. Lilac Drive, Minneapolis 22, Minn. Full data on the highly maneuverable Tennant Model 75 Sweeper is included. Get your copy by checking the reply card.

Disposal of Brush and Tree Limbs a Problem? Here's your answer.

222. A new booklet, "The Modern Approach to the Brush Problem," shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

Davis Back-Hoe and Davis Loader

312. Literature is available from Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis back-hoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

New Acker Vane Shear Tester

367. A bulletin describing a new inexpensive accurate technique for obtaining "in-place" shear readings of soils is available from Acker Drill Co., Inc., Scranton 3, Pa. The shear test kit has a complete set of vane test tools for testing soils to depths of 100 ft., and operating information on this kit is covered in Bulletin 700, available by checking the reply card.

The Ideal Rotary Cutter For Highway Mowing

381. Specifications and features of the B-M-B rotary cutter are fully described in literature available from B-M-B Co., Inc., 319-21 New York Ave., Holton, Kansas. Can be used for highways, airports, waterways and industrial plants.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co, Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

Safti-Design Hi-Way Rotary Mower

454. A rotary mower that mows a full 60-inch swath and has the exclusive safti-design is described in catalog available from Sunflower Industries, Inc., Olathe, Kansas. Complete specifications on this mower and other information can be had by checking the handy reply card.

Hydraulic Backhoe For Many Makes of Tractors

456. A backhoe that digs sewer systems, culverts, water mains, foundations and ditches is described fully in literature from Henry Mfg. Co., Inc., 1700 N. Clay St., Topeka, Kans. Check the reply card for specifications and details.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literaure from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Information on 5 Versatile Tractors For Municipal and County Work

484. Tractors that find scores of highly efficient applications in construction, municipalities, utilities and related fields are described fully in a catalog released by Massey-Harris-Ferguson, Inc., Industrial Div., Quality Ave., Racine, Wisc. Models, specifications, attachments and uses are covered.

Sherman Power Digger For Digging in Any Soil

493. Sherman Major power digger literature is now available, providing details on this new hydraulic backhoe designed specifically for attachment to Fordson-Major tractors. The unit can dig to a depth of 12½ ft. and can dig through a 180 arc of swing and to a loading height of 8 ft. 8 in. Specifications and operation are fully covered. The 8-page colored catalog can be obtained from Sherman Products, Inc., 3200 West 14 Mile Road, Royal Oak, Mich., or by checking the handy reply card.

Check Diamond Chemicals before budgeting new mowers

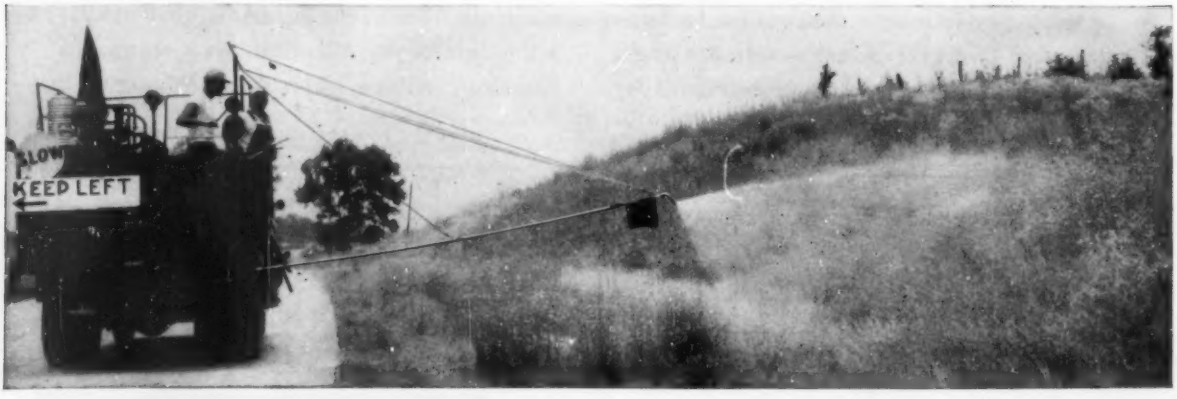
With DIAMOND herbicides on the job, there may be years more life in present mowing equipment. Three-year tests just completed prove that a combination of chemical weed killers and brush killers applied three times a year drastically cuts the number of mowings required. Not only does this bring costs into line, it also controls weeds and brush 30 feet or more back from the roadway.

And once control is established, sprayings can be less frequent, costs even lower.

Whether you plan to operate your own spray equipment or employ contract sprayers, it will pay you to check with DIAMOND on what to use and when to use it. We'll gladly have a technical man call on you. Write DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

Photo by The Davey Tree Expert Company



Rowe Construction Co., Bloomington, Illinois, uses the Model 374 Conveyor, one of many types and sizes of Barber-Greene portables.

The president of Rowe Construction Co. reports

"Our next portable conveyor will be another Barber-Greene"

"We have given our Barber-Greene conveyor four years of hard service and its performance has been tops. We produce sand and gravel for highway departments and for our own use. So we move our plant three and four times a year. Towing our conveyor from job to job presents no problem at all. We just hitch it up to a truck and move out.

"And it was no big job to lengthen our conveyor from 51 to 60 feet. All we did was order a nine-foot intermediate section and bolt it into place. All carriers, returns and decking were already in place and aligned.

"With this kind of reliability and easy flexibility, we feel sure our next portable conveyor will be a Barber-Greene."

Straight-forward reports like D. H. Rowe's provide the proof of the superior performance and widespread acceptance of Barber-Greene conveyors. Handling coal, sand, gravel and other bulk materials, these versatile conveyors operate on a virtually automatic basis . . . cut labor costs substantially.

Not just portability, but road-ability is one of the many features that save time and money for the Rowe Construction Co.

Literature shows the many superior features of Barber-Greene portables. Write for your copy. 56-21-PO

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

To order these helpful booklets check the reply card opposite page 34.

Four-Wheel-Drive Tractor Shovels

372. Literature is available on the Model HU and Model HH Payloader tractor shovels. Features, specifications, capacities and performances are fully covered. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill.

Construction Methods for Salt Stabilized Roads

609. A comprehensive booklet showing modern methods of salt stabilization is available from the Morton Salt Co., 120 So. LaSalle St., Chicago 3, Ill. Stabilized secondary roads, base courses and shoulders are discussed and all equipment and construction methods are covered. Just check the reply card for your copy.

For Prompt Service Use The Reply Card

Helpful Data on Distributors for Bituminous Materials

611. Pressure distributors featuring uniform pressure and temperature, accurate displacement pumping, convenient operation are described in literature of Standard Steel Works, North Kansas City, Mo.

Fifty Combinations of Matching Equipment For Case-Terra Trac Tractors

617. Dump loaders, angledozers, bulldozer blader, backhoes, mowers and scarifiers are several of the attachments available for the 40 to 100 hp Case-Terra Trac crawlers and industrial wheel tractors. For complete information on the attachments and tractors write J. I. Case Co., Racine, Wisc., or check the reply card.

Rotary Mowers For Roadside Maintenance

622. Rotary mowers that fit most makes of 4-wheel tractors are described in literature available from Danuser Machine Works Inc., Tulsa, Oklahoma. For complete information on these units for grass, weed and brush control check the reply card today.

Attachments For Ford Tractors

643. Clearing, backfilling, ditching, excavating, mowing, scarifying, sweeping, and trenching equipment are a few of the attachments described in literature from Tractor and Implement Div., Ford Motor Co., 2500 East Maple Road, Birmingham, Mich.

1/2-Yard Trencher and Swing Loader

651. The Oliver ½-yard trencher and swing loader is described fully in literature from The Oliver Corp., 400 West Madison St., Chicago 6, Ill. Check the reply card for features, operation and uses of this trencher.

Hi-Way Widener Catalog

697. A 4-page catalog covering the Gar Wood-Buckeye Hi-Way Widener is now available from Gar Wood Industries, Inc., Customer Service Dept., Wayne, Mich. The unit excavates and finish grades a highway widening trench in one pass. Check the reply card for full details.

Bulletin on Line of 3-Wheel Rollers

700. Bulletin #HWR 531 describes in detail both the construction and effective use of Huber-Warco's 3-wheel rollers, standard and variable weight models. Information on the main frame, torque converter, tail shaft governor, 2-speed transmission and the guide roll assembly is included. Check the reply card or write Huber-Warco Co., Marion, Ohio.

Service Bodies to Suit Your Maintenance Needs

706. Service bodies, tailored to fit the needs of any municipal department and featuring many outstanding features of construction and design, are described in literature of Morrison Steel Products, Inc., 601 Amherst St., Buffalo 7, N. Y. The line has models to fit all popular truck chasses; ½ to 1½-ton; single or dual wheel. Be sure to check the 18 different compartment arrangements and engineered accessories offered for time-saving convenience and efficiency of your maintenance crews.

CONSTRUCTION EQUIPMENT AND MATERIALS

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Sidecrane-Backfiller-Tamper, A Versatile 3-Way Machine

125. A 3-way machine, the Cleveland 80W, that is a backfiller, sidecrane and tamper is described fully in a 12-page Bulletin, No. L-102, available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Design and construction features, photographs of the machine in operation and complete dimensions and specifications are covered. Check the reply card.

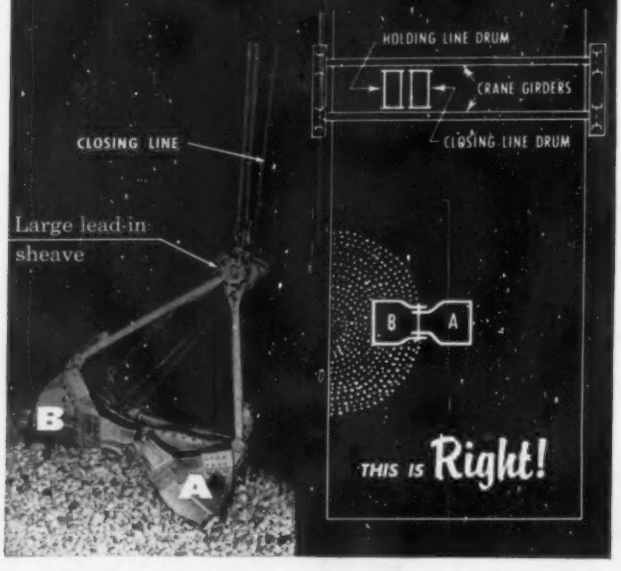
Heavy-Duty Pipe Cutter Works In or Out of Trench

164. Built to stand the most severe service, the all-purpose Ellis & Ford pipe cutter, for cast iron water mains 4" through 12", is easy to use in tight places, works in or out of trench. Full details on cutter and interchangeable parts in Catalog 39, available by checking coupon. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the reply card today.

Blaw-Knox Bucket Experts show You HOW TO OBTAIN



MAXIMUM CABLE LIFE

Users of overhead traveling bucket cranes report amazing cable life increases as a result of applying the practical recommendations, graphically presented with fourteen illustrations of right and wrong bucket applications in Blaw-Knox Bulletin 2510.

This bulletin illustrates and describes proper and improper relationship between:

1. The preferred or required direction of bucket opening.
2. Location and contours of the piles of material.
3. The position of the holding and closing drums in the overhead crane trolley.

An understanding of this relationship has invariably lead to marked improvement in cable life and bucket performance. Send for your copy of form 2510 today.

BLAW-KNOX COMPANY

BLAW-KNOX EQUIPMENT DIVISION

Pittsburgh 38, Pa. • Offices in Principal Cities

Fastest Cycle Ever!
25% Greater Loads!

Now with the

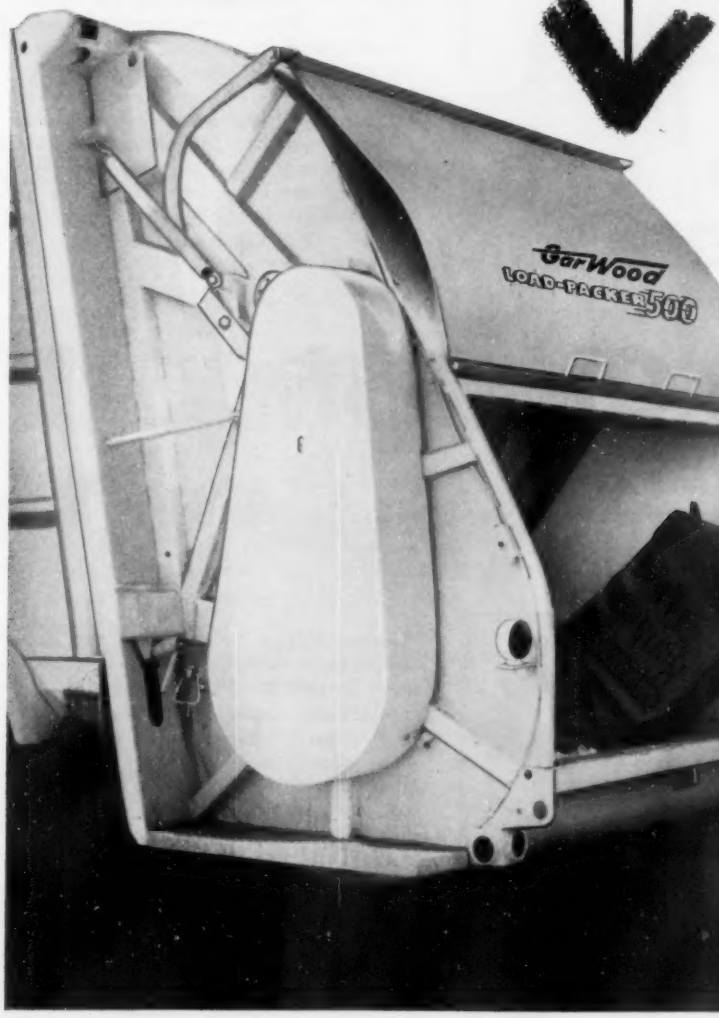
LOAD-PACKER® 500

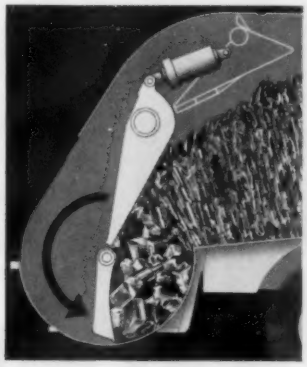
Start reloading in 4 seconds after cycle starts, thanks to Cyclomatic Packing! For the first time on any unit, rotary panel is designed only to clean hopper . . . packing panel is designed only to pack. Loading is faster, more efficient. Complete cycle takes only 10 seconds.

25% greater loads in competitive Sanitary Department tests in major cities. Full-width packing panel, powered by dual 7-inch cylinders, exerts up to 81,000 pounds of force. Packs with a single direct thrust at floor level.

20% more hopper capacity with big 1½-cubic-yard hopper. Full 75-inch opening and exceptionally low loading height make crew's job easier than ever before. Get all the facts by calling your Gar Wood-St. Paul truck equipment distributor. Or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.
Wayne, Michigan • Richmond, California





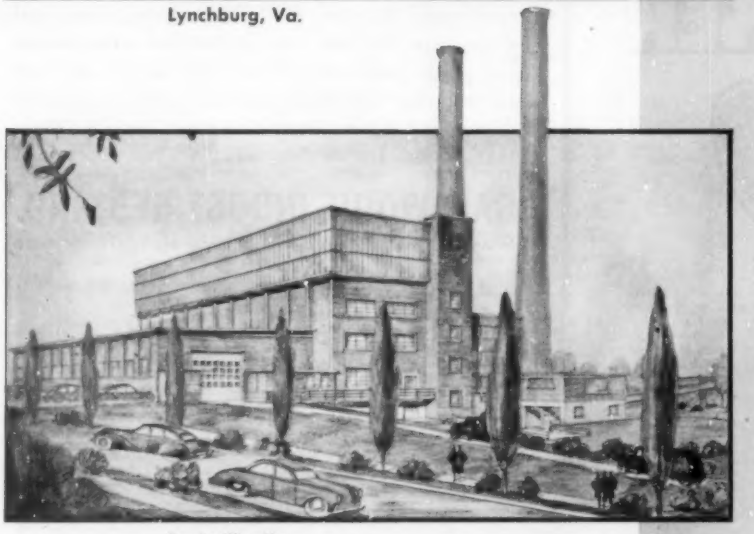
START RELOADING IN 4 SECONDS!

1½-cubic-yard hopper is cleared for reloading in just 4 seconds after cycle starts. Complete cycle takes only 10 seconds. Combination of fast cycle and big hopper results in faster loading than ever before.

GarWood

Lynchburg, Va.

Drying Sludge for Fertilizer — The new sewage treatment plant at Lynchburg, Virginia, is designed for a population equivalent of 70,000. It will have a design flow of 11,000,000 gallons per day and will produce primary digested sludge. A C-E Raymond Flash Drying System, complete with storage bin and bagging equipment, will dry this sludge for use as a fertilizer. The flash drying equipment will evaporate 2,750 pounds of water per hour while producing 1,225 pounds of dry solids.
Wiley & Wilson, Engineers.



Louisville, Ky.

Drying and/or Incinerating Sludge with Refuse — The two C-E Raymond Flash Drying Systems to be installed in Louisville's new refuse disposal plant provide an economical and flexible sludge disposal facility. Sludge filter cake will be trucked from the sewage treatment plant to the refuse disposal plant. Utilizing the refuse incinerator's waste heat, the C-E Flash Drying Units dry the entire sludge output. It can then be sold as fertilizer or used on municipal golf courses, parks and lawns. Unused sludge can be incinerated with the City's refuse. The plant serves a population equivalent of about 500,000.
Metcalf & Eddy, Engineers.

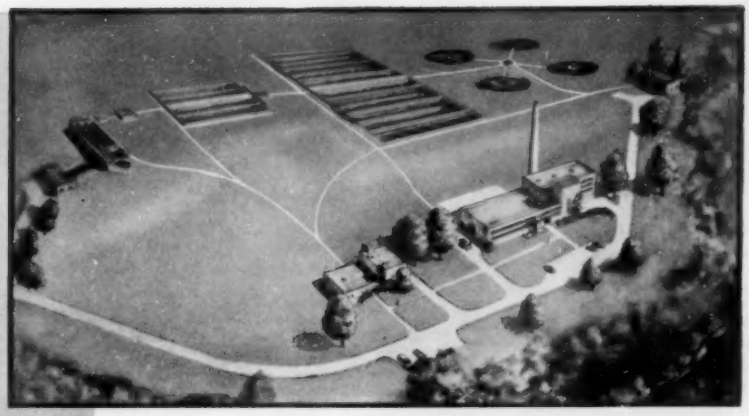
THEY CHOSE C-E

Pittsburgh, Pa.

Sewage Sludge Incineration — This seventeen million dollar plant will serve seventy communities in the Pittsburgh area, having a population equivalent of 1,500,000. It will include four C-E Raymond Flash Drying and Incineration Systems capable of handling over 300 tons of concentrated sludge per day. They are designed to burn 55 tons of dry solids while evaporating more than 250 tons of water. Each unit will be equipped with a Deodorizing System to free all foul gases of objectionable odor. In addition, each unit will incorporate equipment for the control of fly ash.
Metcalf & Eddy, Engineers.

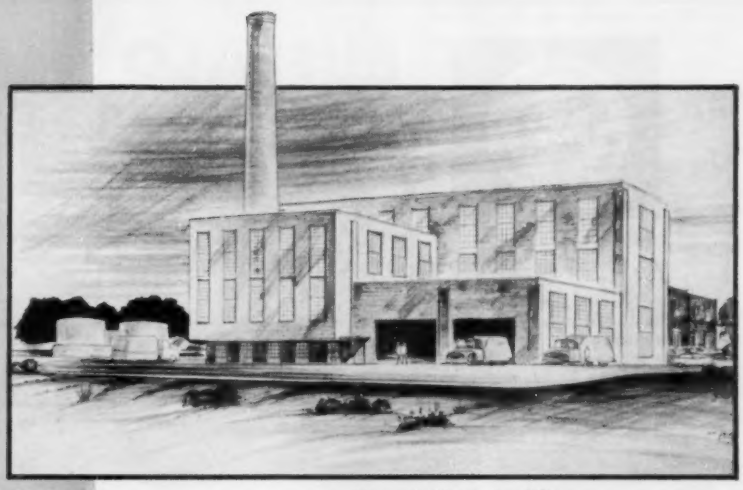
To order these helpful booklets check the reply card opposite page 34.

Drying and/or Incinerating Sludge — This plant, designed to serve an equivalent population of 136,000 in the Warren area, will produce both activated and raw primary sludges. Three C-E Raymond Flash Drying Systems will dry and/or incinerate its entire output. Because of the heavy concentration of diversified industry in the Warren area, it is planned to use only one of the three C-E Raymond units to dry sludge for use as a soil conditioner. The remaining two units will be used for incineration, but can be quickly and easily converted to fertilizer production. ***Johnson & Anderson, Engineers.***



Warren, Mich.

Disposal of All Municipal Wastes — This new plant will dispose of all municipal refuse from the cities of Neenah and Menasha, Wisconsin. Garbage, rubbish and refuse, and sewage sludge will be burned in two C-E Traveling Grate Refuse Incinerators. Heat from the incinerators will be used in a C-E Raymond Flash Drying System to dry the entire output of sludge from the sewage treatment plant. Once dry, it can be used for fertilizer, if desired, or returned to either or both of the incinerators and burned. ***McMahon Engineering Co., Engineers.***



Neenah-Menasha, Wisc.

RAYMOND IN 1956

The C-E Raymond Flash Drying and Incineration System for sewage sludge disposal is the most versatile and flexible system available. As evidenced by these brief descriptions of some 1956 contracts, the C-E Raymond Flash Drying System can be used to dry sludge for use as a soil conditioner, to incinerate it to a sterile ash, or both. It can be combined with existing refuse incinerators or installed integral with the C-E Traveling Grate Refuse Incinerator to take advantage of available waste heat resulting from the incineration of garbage and refuse. It can be equipped with its own heat source, burning either dry sludge or purchased fuel.

If you are considering new sewage disposal facilities — alone or in combination with refuse disposal, see C-E. We will be happy to discuss your needs with you and with your consultants.

COMBUSTION ENGINEERING

C-E

B-994

RAYMOND DIVISION, 1315 North Branch Street, Chicago 22, Illinois
Eastern Office: 200 Madison Avenue, New York 16, N. Y.
Western Office: 510 West Sixth Street, Los Angeles 14, Cal.

ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

To order these helpful booklets check the reply card opposite page 34.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the reply card or write to Butler Mfg. Co., Kansas City, Mo.

Complete Line of Construction Equipment

692. The complete lines of Blaw-Knox equipment for concrete and bituminous paving, ready-mix plants and general construction are colorfully illustrated in a 24-page bulletin. There are 14 basic items of equipment described and also listed are a number of other bulletins that are available. Check the reply card or write Blaw-Knox Co., Construction Equipment Div., Advertising Dept., Mattoon, Ill.

A Tractor-Air Compressor Unit

140. "Around the Clock, Around the World" is the title of an 8-page bulletin describing Le Roi's new 125 Tractair, a self-propelled compressor unit with flexible tractor power. Applications, uses, attachments and tools, design and specifications of the compressor and engine are listed. Write Le Roi Division of Westinghouse Air Brake Company, 1706 South 68, Milwaukee 14, Wisconsin, or check the reply card for your copy.

Literature on Asphalt and Aggregate Spreaders

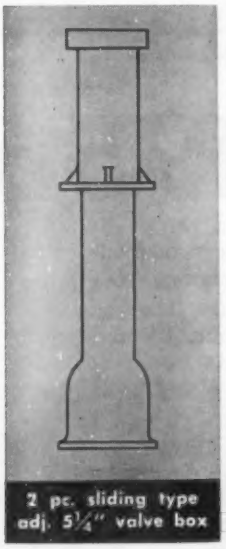
431. Aggregate and asphalt spreaders are fully described in literature available from Good Roads Machinery Corp., Minerva, Ohio. The "Odell" and "Handy" speakers can be hitched to any standard dump truck and can spread asphalt, gravel, clay, limestone for highway construction and maintenance. For full details check the reply card.

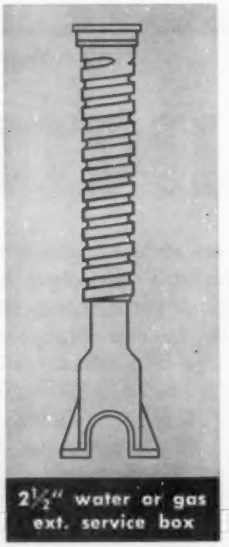
BUFFALO PIPE & FOUNDRY

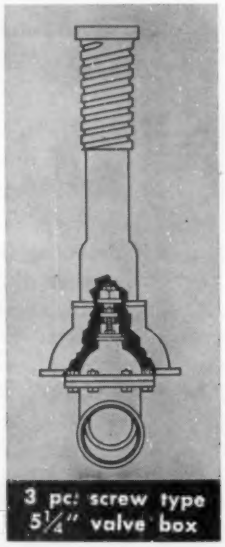
BUFFALO MUNICIPAL CASTINGS

are available in every size and style!

No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.


2 pc. sliding type adj. 5¼" valve box


2½" water or gas ext. service box


3 pc. screw type 5¼" valve box

Prompt quotations given on all your standard or special gray iron or non-ferrous castings.

Write or wire Dept. J for Bulletin MII.

SINCE 1930
BUFFALO PIPE & FOUNDRY CORP.

BOX 55 — STATION B DE 6764 BUFFALO 7, N.Y.

"Arctic Boy" Portable Water Coolers

432. Descriptive literature is available on portable water coolers and cans with the Sparkleen Liner. Sizes, models and price lists are fully covered in bulletins from Schlueter Mfg. Co., 4616 N. Broadway, St. Louis 7, Mo. Check the handy reply card.

Complete Bulletin On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 108-page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill., by checking the reply card.

3-Way Ditcher-Terracing Blades

488. Servis heavy duty and standard 3-way ditcher-terracing blades with scarifier teeth, grader wheels and end plates for conversion to a leveling scraper are described in bulletin available from Servis Equipment Co., 1000 Singleton Blvd., Dallas 21 Texas. Check the reply card for specifications, design and application.

Joint Materials and Sealers Described in Latest Literature

492. Fibre material, asphalt board, cold pour joint sealer, crack fillers and concrete curing compound are described fully in literature available from Presstite-Keystone Engr. Products Co., 3906 Chouteau Ave., St. Louis 10, Mo. Check the reply card for information on these paving and building products.

Agent For Improving Adhesion Between Old and New Concrete

530. Thorobond liquid bonding agent for improving adhesion of new concrete to old concrete walls, floors and ceilings is described in literature available from Standard Dry Wall Products, Inc., New Eagle, Pa. Check the reply card for information on typical uses and methods of application.

Complete Structural Systems and Curtain Wall Panels

704. Available Stran-Steel shapes, applications, installation details, dimensions and properties, safe uniform load tables for Stran-Steel joists and design examples are covered in catalog available from Stran-Steel Corp., Detroit 29, Mich. Check the reply card today.

•

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Sand, Chip and Calcium Chloride Spreader For Ice Control

683. Complete specifications, performance records and prices on the Fox sand spreader are covered in literature from Fox River Tractor Co., Dept. R3, P. O. Box 469, Appleton, Wisc. Spreader can be attached or removed from most any dump truck in 15 minutes and can be operated from 5 to 40 miles per hour. Check the reply card.

•

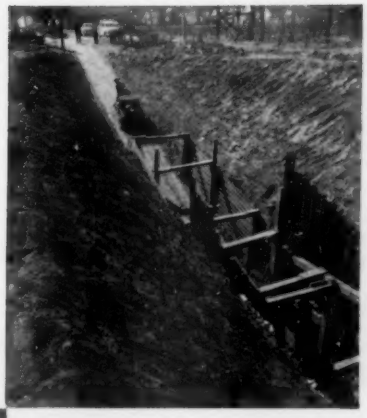
BUSINESS ADMINISTRATION

Save Space By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

To order these helpful booklets check the reply card opposite page 34.

How Topeka Installed a Sewer Under a Railroad



Sides of the approach ramp were shored up with Armco Steel Sheeting, allowing a motorized wagon to remove soil.

Each time tunneling advanced 18 inches, a new ring of Armco Liner Plates was bolted to the casing already in place.

A new interceptor sewer line in Topeka, Kansas, had to cross under the main line of a railroad. Armco Tunnel Liner Plates helped solve the problem quickly, safely and economically.

Workmen tunneled under the tracks, using high strength, lightweight Armco Liner Plates. The tunnel provides a permanent opening through which the sewer line was installed. It permits access for inspection and maintenance, and protects the sewer from railroad vibrations.

Armco Liner Plate is the strongest per pound of weight of any commonly used tunnel liner. It is available in a wide range of diameters, shapes, and gages. Many cities have found Armco Liner Plates the practical answer for all types of utility conduits under streets, railroads, and buildings. They are also valuable for tunneling pedestrian and vehicular underpasses. Write for more data. Armco Drainage & Metal Products, Inc., 5057 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO LINER PLATES

To order these helpful booklets check the reply card opposite page 34.

STREET LIGHTING AND TRAFFIC CONTROL

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by the Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

A Guide to Effective Traffic Safety

468. A 20-page catalog with hundreds of illustrations of all types of signs used on highways and in motor and pedestrian traffic areas is offered to public works officials by Traffic and Street Sign Co., 84 Foundry St., Newark 5, N.J. This convenient reference covers all your sign needs.

Use The Reply Card

Engineering Guide on Mercury Street Lighting

640. Technical data on mercury lamps applicable to general lighting service, operating characteristics of the mercury vapor lighting system and economic evaluation of lighting systems designed for equal lighting results are several of the sections covered in catalog from Westinghouse Electric Corp., Lighting Div., Edgewater Park, Cleveland, Ohio.

Valuable Traffic Control Manual

676. Reflectorized everlasting flexible plastic that is available in various sizes, shapes and strips is described in manual available from Economarker Safety Corp., 1820 Central Parkway, Cincinnati 14, Ohio. Prefabricated legends, numerals and directional arrows are types included. Check the reply card.

. . . All the component parts are important

. . . for instance, the design of the grates alone is by itself important but is still only one of the many, many components —likewise the stack, charging arrangement, materials handling, instrumentation, controls, blowers, refractories, etc., etc., etc.

It is skill and ability, based upon experience, that properly combine these parts to make a modern incinerator plant.

Call on Nichols' experience.

Nichols Engineering & Research Corp.
70 Pine St., New York 5, N. Y.
1637 N. Illinois St., Indianapolis 2, Ind.
1477 Sherbrooke St. W., Montreal 25, Canada

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I. Check the reply card now to learn how your collection problems can be eased.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy reply card.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check the reply card today for catalog No. 1702 from Flynn and Emrich Co., Holiday and Saratoga Sts., Baltimore 2, Md.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 5, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

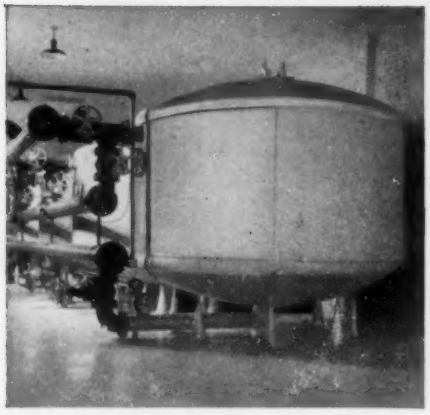
What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the reply card.

WEED AND DUST CONTROL

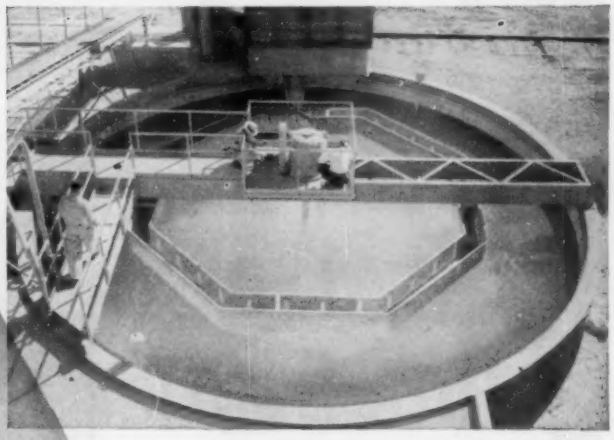
How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.



Why General Filter?

There are many reasons why municipalities and industries have installed General Filter water treating plants:



INSTALLATION SUPERVISION. . . . General Filter "job-engineers" each installation to the consulting engineer's specification . . . supervises the installation and trains the personnel who will work with the equipment.

OPERATIONAL DEPENDABILITY . . . for twenty years General Filter has concentrated all of its efforts toward "better water treatment". Their efforts have produced water treating plants and equipment that are *completely* dependable.

ENGINEERING KNOW-HOW . . . General Filter's design and construction engineers are familiar with the problems involved in water treatment.

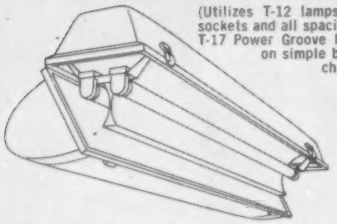
GREATER ECONOMY . . . the only real test of economy is a long term test. General Filter plants stand up over the years providing "better water" with minimum maintenance, longer trouble-free, smoother operation.

Find out why you should specify General Filter . . . Write today for detailed information regarding your water treatment problems.

General Filter Company
AMES, IOWA
. . . "better water"

AERATORS • FILTERS • TASTE AND ODOR • ALKALINITY CONTROL • HIGH CAPACITY RESINOUS ZEOLITE • IRON RUST REMOVAL • DEMINERALIZATION • SOFTENERS

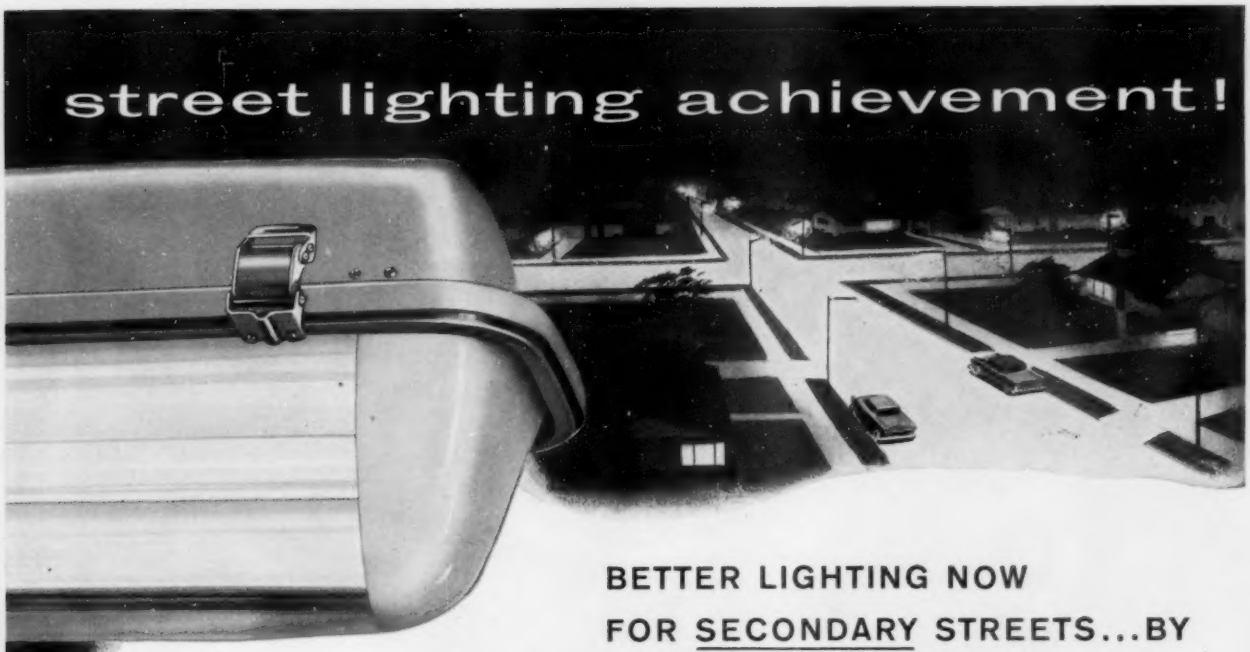
Still another Westinghouse



(Utilizes T-12 lamps. Has sockets and all spacing for T-17 Power Groove lamps, on simple ballast change.)

2FSL Available in 4-ft. and 6-ft. models

1. Fiber-Glass Housing contains ballast — is impervious to impact, corrosion! Never needs painting! 2. Acrylic Plastic Globe is unaffected by weather, never discolors, warps or cracks! Improved gasket is "sponge" foam Vinyl! 3. Reflectors are specially high-polished, finshed by famed Alzak Process — give maximum light output from the lamps employed! Open either way. Easiest installation! 4. Cast-Aluminum Slip-Fitter has 7° adjustment. Quickest leveling! 5. 2-Way Latch-and-Hinge Assembly opens either way. Fast maintenance! EVERY REFINEMENT REQUESTED BY FOREMOST LIGHTING ENGINEERS!



BETTER LIGHTING NOW
FOR SECONDARY STREETS...BY

5 MAJOR IMPROVEMENTS IN NEW 2-FSL FLUORESCENT LUMINAIRE!

Broader areas are bathed in natural, low-glare "high-visibility" light! All five specific refinements acclaimed by recognized Lighting Engineers!

All the outstanding success of today's modern lighting of primary streets—produced by the famous Westinghouse 4FSL (4-lamp) fluorescent luminaire—is now available for secondary business streets and important suburban thorofares!

Westinghouse has created a new, 2-lamp luminaire—the 2FSL—that capitalizes more completely than ever before on the use of tubular fluorescent light-source for street illumination.

This engineering of the 2FSL encompasses 5 distinct improvements. They are advancements providing unprecedented lighting efficiency, remarkably long service life, and speed and ease of application, installation and maintenance unparalleled in the past!

1. **Housing of Doubly Reinforced Fiber-Glass** is corrosion-free!—impervious to impact! *Cannot* dent! Permanent color is molded through. *No painting* is *ever* necessary! Wide flange creates ideal gasket seat and water shed!
2. **Globe of Acrylic Plastic** is light in weight but *extra* durable. Will not discolor, warp or crack. Is unaffected by weather, temperature or ultra-violet rays. Flanged edge "mates" with housing by specially seated "sponge" foam Vinyl gasket.
3. **Specular Aluminum Reflectors** are specially high-polished!—finished by the famed Alzak process! Deliver *maximum* light output from the lamps employed, with "ideal" light distribution! Assembly opens from either side for easiest access, simplified mounting and wiring to terminal block.
4. **Cast-Aluminum Slip-Fitter** accommodates 2" pipe, extending full 13" into housing, quickly secured by special clamp. Allows complete 7° adjustment — providing quick and easy leveling.
5. **New, 2-Way Latch-and-Hinge Assembly** simplifies maintenance. Permits globe to open either way. Stainless steel latches and springs (2 pair on 4-ft. unit, 3 pair on 6-ft. model) maintain *secure* gasket seal!

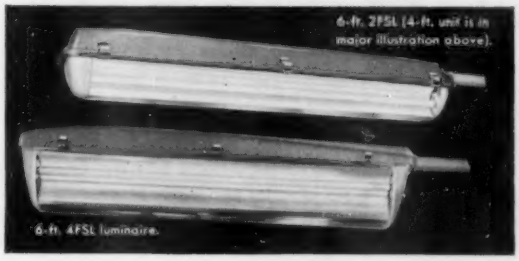
This new 2FSL luminaire incorporates every development proved superior by Westinghouse—acknowledged to be the nation's foremost authority on modern street-illumination.

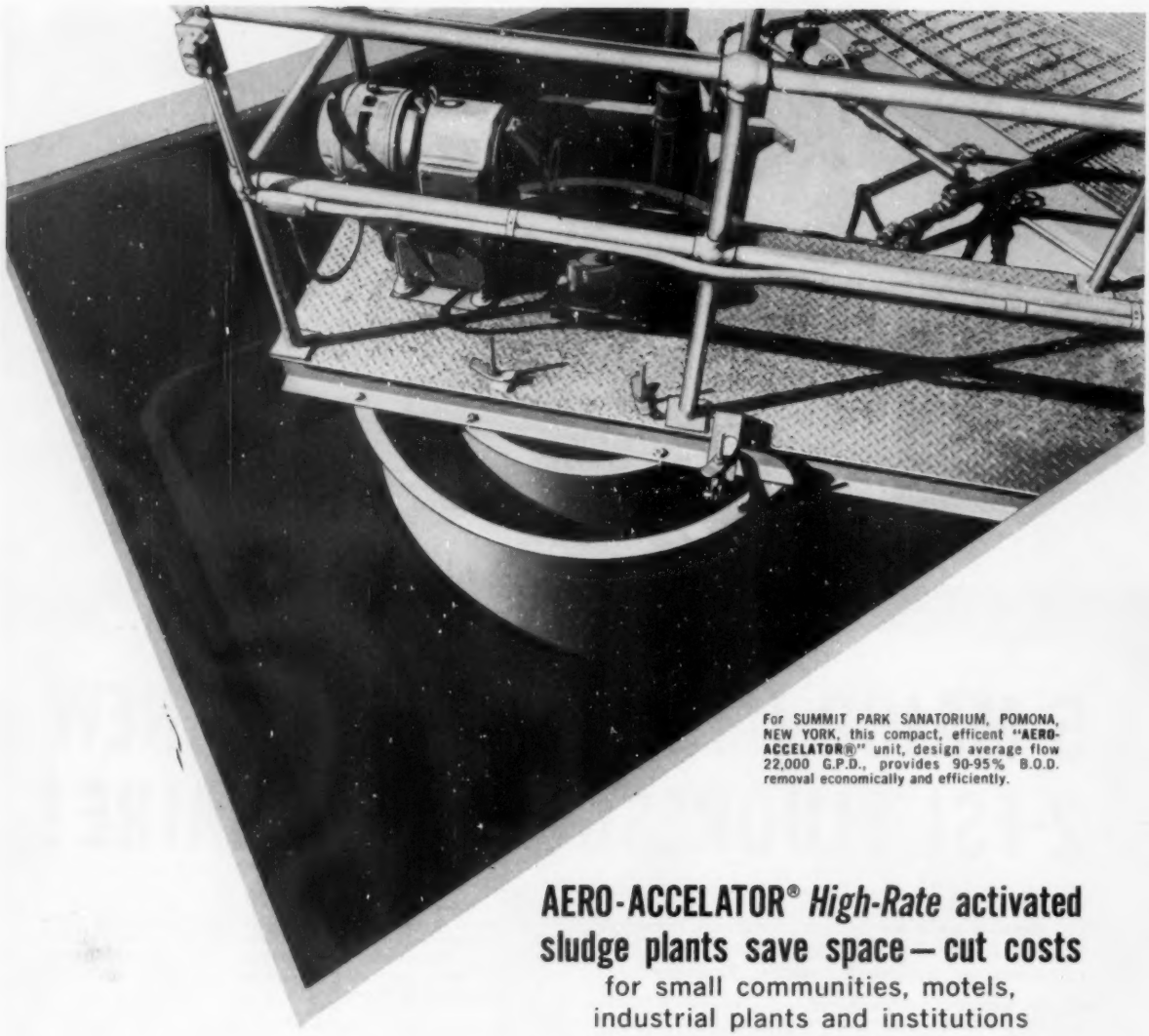
ACCURATE, FORTHRIGHT ANALYSIS OF EVERY STREET-LIGHTING PROBLEM. SOUNDEST RECOMMENDATIONS AT LOWEST PRACTICAL COST!

Westinghouse makes scientifically superior luminaires for *every type application!* — that most efficiently utilize *every type of light source!*

Westinghouse Lighting Specialists, therefore, *always* recommend *only the best possible system!* — *for each specific street-lighting situation!* — *consistent with the lowest possible costs that are practical today!* J-04411

YOU CAN BE SURE..IF IT'S Westinghouse





For SUMMIT PARK SANATORIUM, POMONA, NEW YORK, this compact, efficent "AERO-ACCELATOR®" unit, design average flow 22,000 G.P.D., provides 90-95% B.O.D. removal economically and efficiently.

AERO-ACCELATOR® *High-Rate* activated sludge plants save space—cut costs

for small communities, motels, industrial plants and institutions

"AERO-ACCELATOR" activated sludge plants provide improved, complete treatment in less than half the time required by ordinary plants. As a result they can be installed in much less space and at greatly reduced cost, without sacrificing efficiency. Here are typical performance figures from the Summit Park installation—

			B.O.D.			Suspended Solids		
			ppm		%	ppm		%
Date	Test Period	Ave. Flow gpm	Raw Sewage	Effl.	Removal	Raw Sewage	Effl.	Removal
9-30-54	7 AM-2 PM	20	264	9.2	96.5	117	7.7	93.4
10-25-54	8 AM-3 PM	25	321	24.0	92.5	301	16.6	94.5
10-30-54	8 AM-12 N	15	325	21.0	93.6	274	15.7	94.3
11-16-54	8 AM-3 PM	20	271	20.5	92.4	268	21.8	91.9
3- 4-55	7 AM-3 PM	20	169	14.0	91.7	125	11.0	91.2

Custom-designed units for all requirements

This type of installation is ideal for small and medium requirements and is also available for large municipal needs.

If you are faced with a pollution problem INFILCO equipment will afford you substantial savings in space, in costs of construction and installation, and in expense of operation. It will pay you to investigate. Write today for "AERO-ACCELATOR" activated sludge plant Bulletin No. 6510.

Inquiries and samples are invited on all problems in the treatment of water, sewage and wastes.

SEE YOUR CONSULTING ENGINEER. He can help you meet your needs with maximum efficiency at minimum cost. We will be happy to cooperate.

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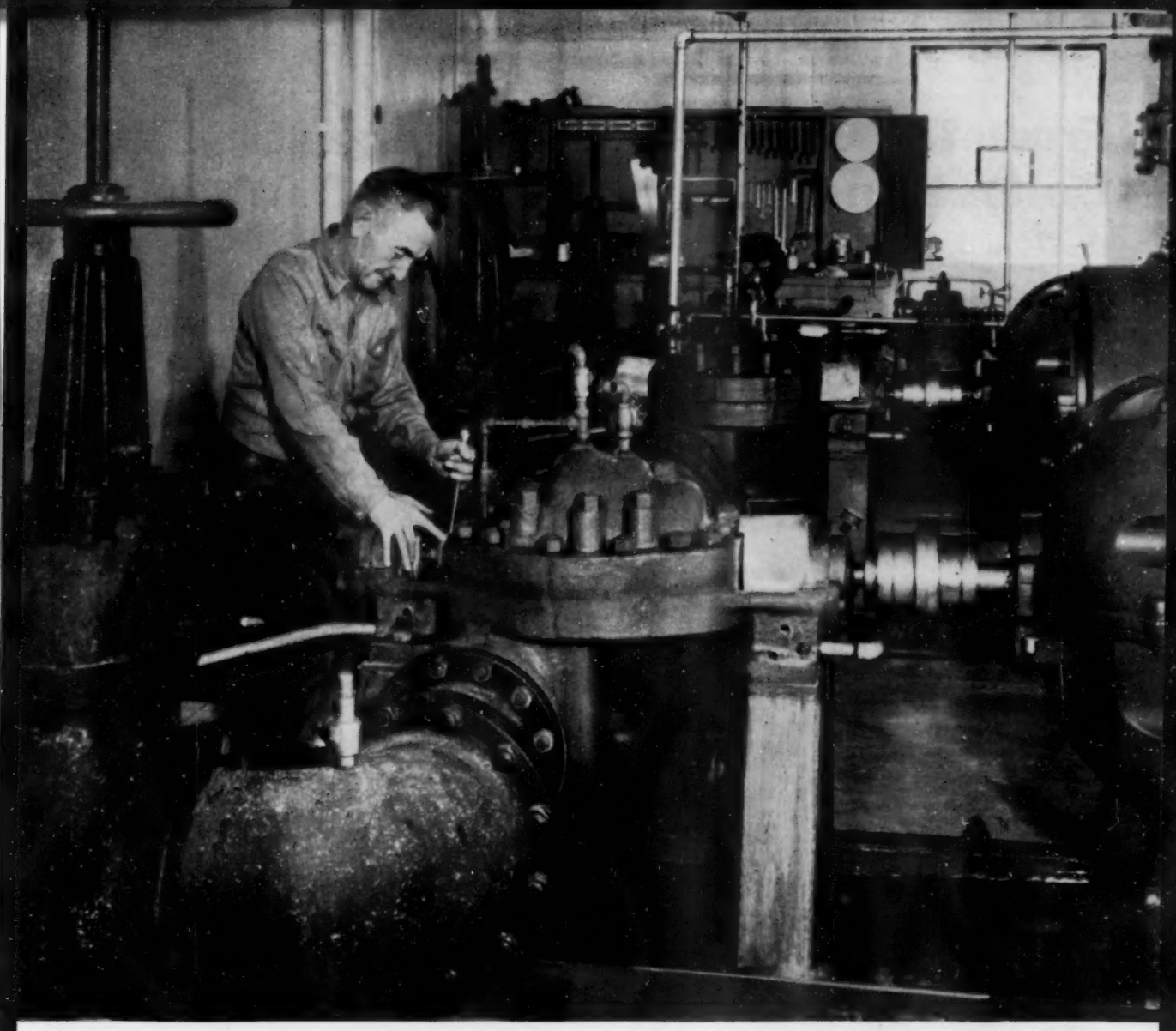
INFILCO

INFILCO INCORPORATED

General Offices · Tucson, Arizona · P.O. Box 5033

Field offices throughout the United States and in foreign countries

THE ONLY COMPANY impartially offering equipment for ALL types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.



Lake George Pumping Station, City of Colorado Springs

6 MILLION GALLONS

. . . of water per day are delivered to City of Colorado Springs by three Worthington 400-hp centrifugal pumps, like that in foreground, at Lake George Pumping Station. A 200-hp engine-driven Worthington is on standby service. This installation was engineered by Black and Veatch Co. of Kansas City, Mo., to meet the demand for water in the City of Colorado Springs, where a population increase of 50% in 10 years, expanding industry, and the new Air Force Academy have greatly spurred water requirements.

The Worthington equipped stations pump water through a total pipeline distance of 92,810 feet with a lift of 1,580 vertical feet. Each station contains three 400-hp Worthington centrifugal pumps each of 2-mgd capacity. A 200-hp gasoline-engine-driven pump on standby service in each station provides minimum flow in case of power failure to prevent possible freezing of the lines.

Colorado Springs also obtains water from Fountain Creek Valley. This water is pumped to a common sump by four 30-hp pumps and from the sump to the distribution system by three 300-hp pumps—all seven pumps being Worthington vertical turbines.

The Colorado Springs water works installation is typical of thousands using rugged, reliable Worthington public works equipment—pumps, engines, compressors, turbines. Worthington engineers will be glad to help you apply this equipment to your water works or sewage needs. Write Worthington Corporation, Public Works Division, Harrison, N. J.

W.7.8.

WORTHINGTON

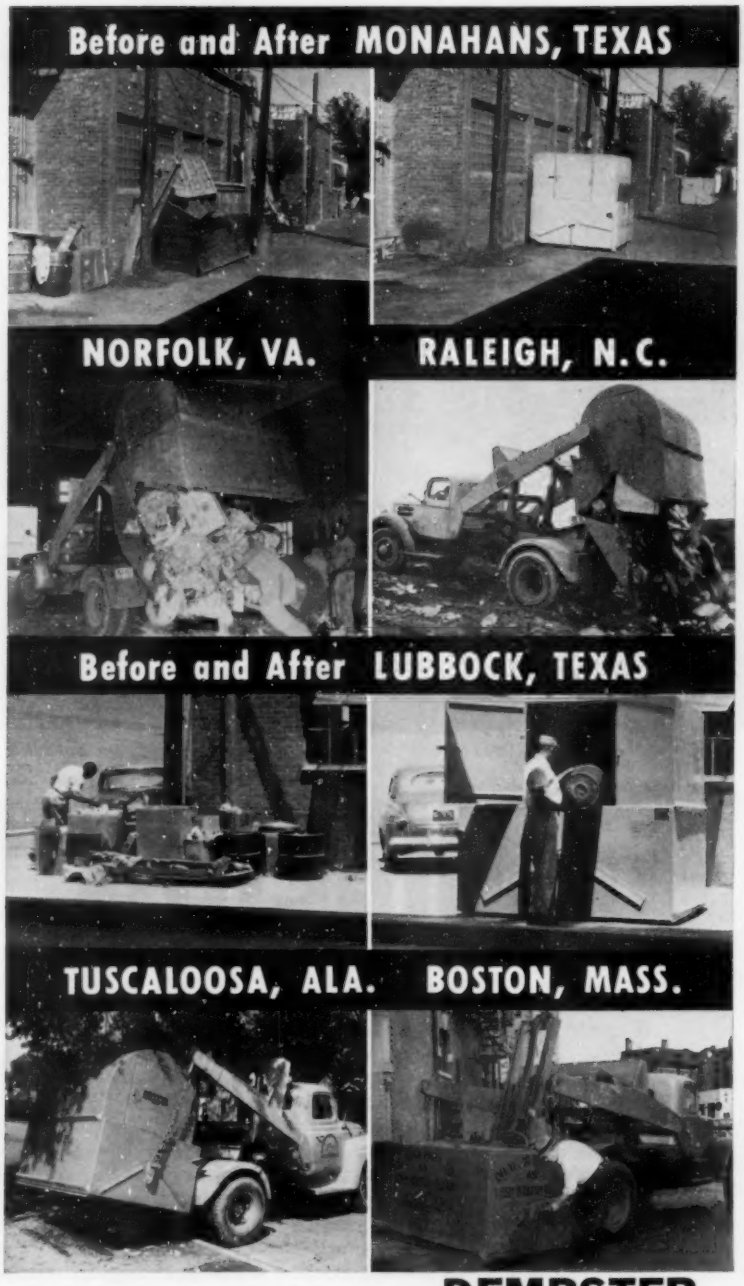
From the Smallest to the Largest—Cities Collection Costs, Increasing Sanitation

Here are just a few cities taking advantage of the economies and sanitation made possible by the Dempster-Dumpster System!

PICKING UP 15-Yard Container . . .

HAULING this huge load to dump . . .

DUMPING it almost instantly!



DEMPSTER

All Over America are Reducing Refuse with the Dempster-Dumpster System!

CITIES AND TOWNS ALL OVER AMERICA, like those below, have found in the Dempster-Dumpster System the solution to unsanitary and costly refuse collection with conventional trucks, drivers and loading crews. You can equip one truck with a hydraulically operated Dempster-Dumpster. This truck-mounted Dempster-Dumpster, with only one man, the driver, serves scores of big detachable containers. These containers replace unsanitary and unsightly trash cans, barrels, drums, etc., at such places as downtown business districts, schools, housing areas, etc. Each is loaded by the user.

On pre-arranged schedule your Dempster-Dumpster picks up, hauls and empties each container — one-after-another. You eliminate loading crews. You increase efficiency, sanitation and city-wide cleanliness. A survey of your commercial refuse problem may be arranged without obligation by writing to us now. Manufactured by Dempster Brothers, Inc.

RICHMOND, VA.

DENVER, COLO.

ROANOKE, VA.

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NASHVILLE, TENN.

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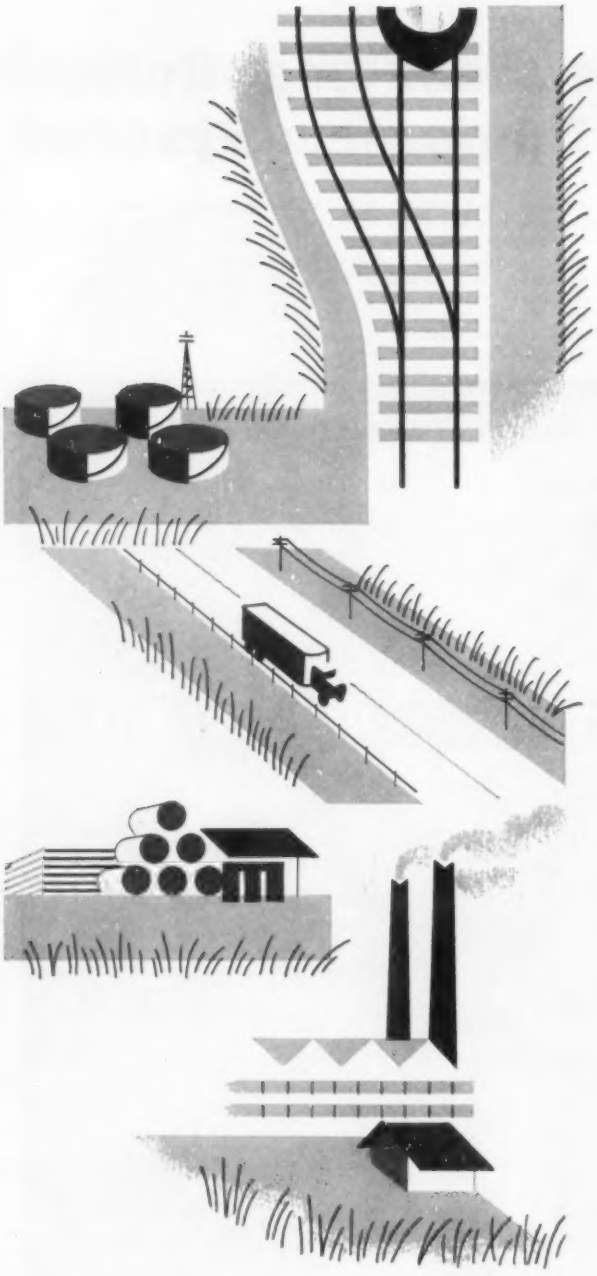
BALTIMORE, MD.

JERSEY CITY, N. J.

PAMPA, TEXAS

LEXINGTON, KY.

BROTHERS 977 Dempster Building, Knoxville 17, Tennessee



announcing . . .

Geigy

SIMAZIN* 50W

a new pre-emergence herbicide

Now available for long residual control of grassy and broadleaf weeds in driveways, roadways, railroads, walks, paths, industrial sites, around buildings and other non-cropped areas.

NOW YOU CAN STOP WEEDS BEFORE THEY START with Geigy's amazing new pre-emergence herbicide Simazin 50W. Think what *preventive* weed control with Simazin 50W can mean in terms of time and money saved for industries, municipalities, highway commissions, railroads, utilities and any other business or service concerned with the problem of weed control on non-cropped areas.

How Simazin 50W Acts

Simazin 50W, a triazine compound, is not a contact or foliage herbicide, but acts on the plant roots, and should be applied just before germination or emergence for best results. Before using Simazin 50W for long residual weed control, existing plant growth should first be removed by use of a contact herbicide, or by mowing or ploughing under.

Long-Residual, Economical

One pre-emergence application of Simazin 50W applied at the rate of 10 lbs. per acre controls most grassy and broadleaf weeds for about a year. The material is economical and easy to use. At the maximum rate of application, less than ½ lb. is required to treat 1,000 sq. ft.

Controls a Variety of Weeds

Simazin 50W controls a wide variety of grasses and broadleaf weeds including barnyard grass, witch grass, yellow foxtail, wild oats, crabgrass, broadleaf plantain, dandelion, lamb's quarters, pigweed, ragweed, nightshade, purslane, velvetleaf and mustard.

Low Toxicity, Non-Corrosive

Simazin 50W has very low toxicity to humans and domestic animals. It is non-corrosive and can be removed from spraying equipment by merely flushing thoroughly with water.

No Lateral Leaching

Since there is practically no lateral leaching, Simazin 50W can be used adjacent to crop land and ornamental areas. Lack of phytotoxicity to foliage minimizes drift hazard.

Availability

Geigy Simazin 50W, containing 50% active ingredient is available in cases of 10 x 5 lb. bags and 50 lb. fiber drums.

Free Technical Bulletin

Send for your free copy of the Simazin Technical Bulletin and descriptive pamphlet. Address Department PW-77.

*"SIMAZIN" is a trademark of Geigy Chemical Corporation

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY AGRICULTURAL CHEMICALS • *Division of Geigy Chemical Corporation* • **Saw Mill River Rd., Ardsley, New York**

MUELLER®

tapping sleeves and valves

are your strongest branch

main connections!

Any movement of a branch main creates high stresses in the main at the branch main connection. Mueller Tapping Sleeves and Valves are designed to actually strengthen the main at this point. Connections may be made quickly—under pressure—without loss of water or interruption of flow.

A special, heavy-flange connection between the tapping sleeve and tapping valve assures positive alignment for accurate drilling and ease of installation.

Mueller Tapping Sleeves are available in either the Mechanical Joint or Calked Type.

A Mechanical Joint Sleeve for a specific nominal size can be adapted to fit all sizes of cast iron pipe regularly used by changing end gaskets.

The Calked Type Sleeve features a raised cast ring which centers the sleeve and reduces the quantity of lead required.

Mueller Tapping Valves have oversize seat openings to allow the use of full-size shell cutters. They can be furnished with "O" ring or conventional packing and mechanical joint or calked outlets. All-bronze disc assemblies are also available.

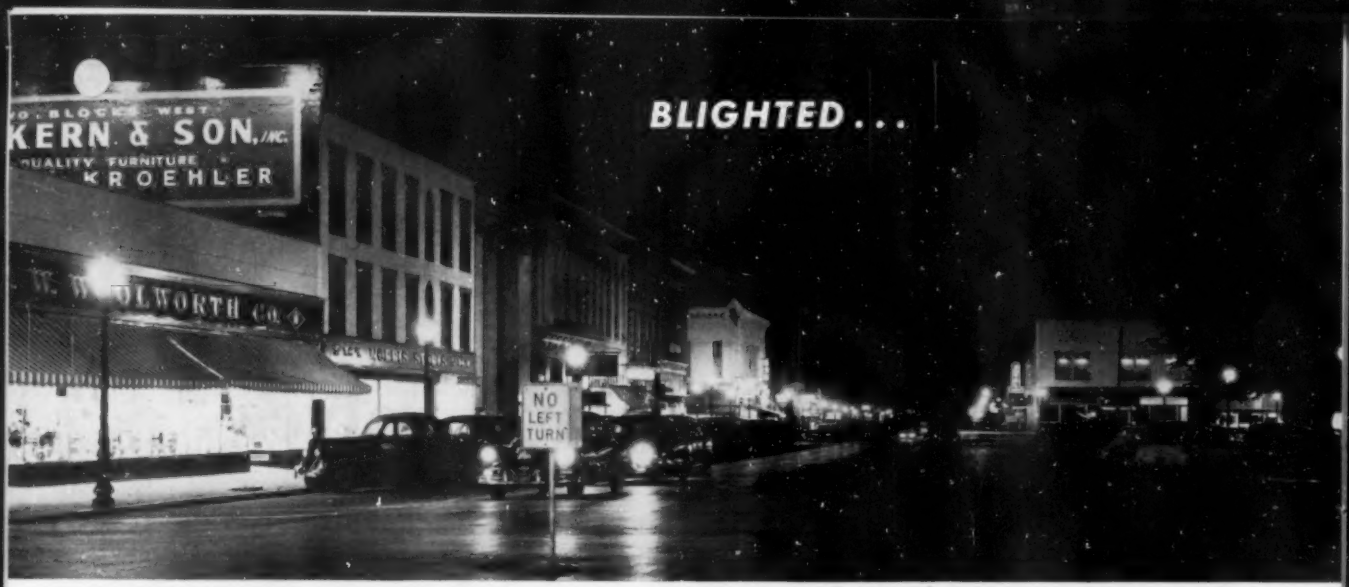
Consult your Mueller Water Works Catalog W-96 or see your Mueller Representative for full details.

Since 1857

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario



GOOD STREET LIGHTING CAN TRANSFORM a gloomy night shopping area into a safe, busy, cheerful symbol of community progress and prosperity.

Think urban renewal is just for big cities?

No, modernization of the "central city" section is not a problem for only the big metropolises. It's a problem that confronts *every* community which wants to keep its downtown section healthy and thriving.

A first step in checking "decay" in your business district is to determine if your public lighting system is up-to-date. For dark, uninviting streets reduce the hours of business, discourage visitors, and spawn accidents, delinquency, and crime.

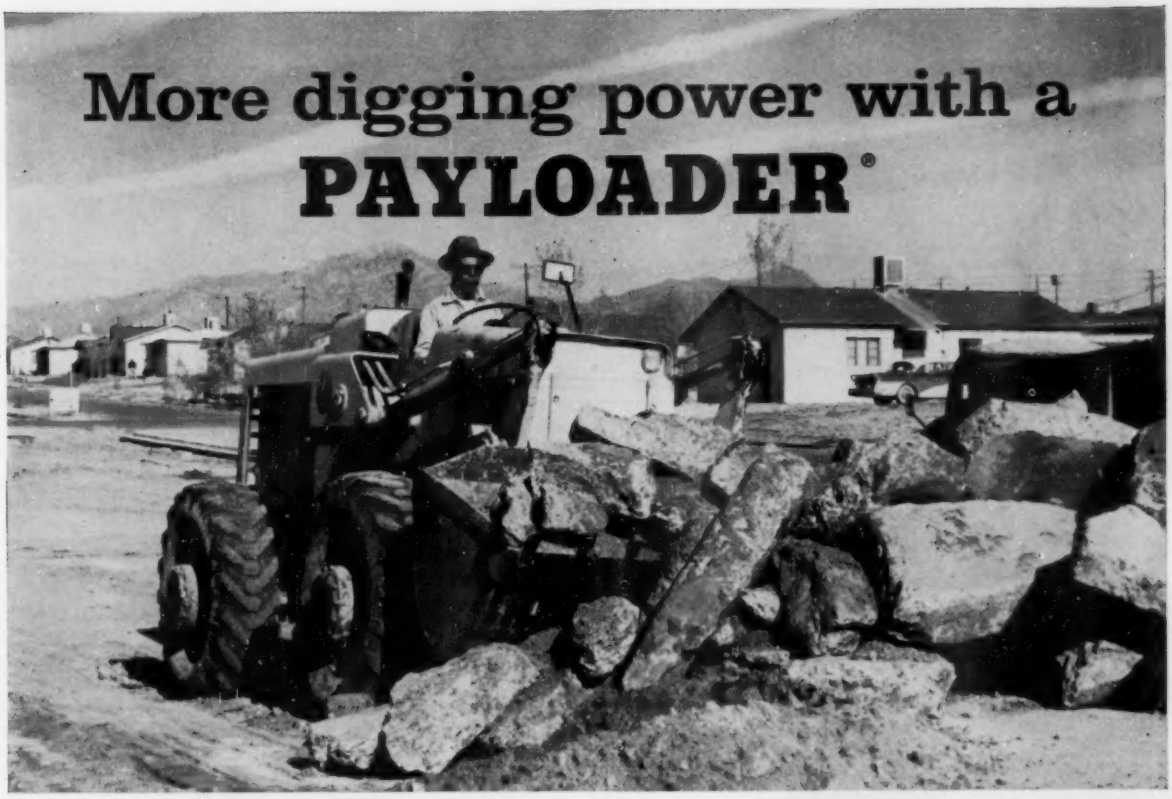
Trade follows the light. Brightly lighted shopping streets attract out-of-town shoppers, as well as helping hold local customers. Real estate values stabilize, even rise, as the business pace quickens. Community pride and spirit soar as the shadows lift, setting the stage for further civic improvements. Good street lighting is contagious!

See your downtown section in a new light! No other major public works program you could sponsor can be achieved at such low cost, or in such a short time. Begin planning your relighting program—right away—with the help of your electric utility. General Electric Co., Schenectady, N. Y. 455-16

Borrow a print of the movie "Out of Darkness" from your nearest G-E Apparatus Sales Office.

GENERAL ELECTRIC

More digging power with a PAYLOADER®

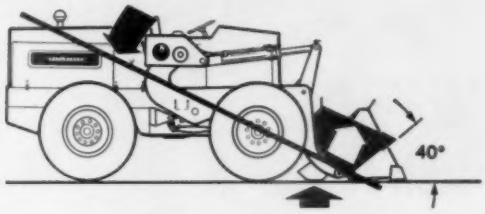


40° bucket roll-back at ground level plus powerful pry-out digging action

In EL PASO, TEXAS — preparing 7,755 feet of subgrade for a new, heavier roadway, Vowell Material Co. use their two "PAYLOADER" Models HO and HH to tear-up and truck-load the old pavement. Each loader keeps 2 and 3 trucks busy besides leveling the areas.

It takes *real digging power* to break-up and pry-out the 10-inch-thick concrete slabs . . . something like the exclusive *bucket action* on a "PAYLOADER" that combines powerful pry-out force with 40° bucket tip-back at ground level.

Add this superior digging power to the other outstanding performance features found in the new "PAYLOADER" models—hydraulic load-shock-absorber . . . power-transfer differentials . . . "no-stop" power-shift transmission . . . planetary final drives . . . power-steering and 4-wheel power brakes — and you'll know why a "PAYLOADER" digs-in and out-produces any wheeled tractor-shovel of comparable size. Your "PAYLOADER" Distributor is ready to prove this performance by having you *try one on your work*. Call him today.



Tremendous pry-out force — almost equal to the weight of the machine — can be exerted at the bucket digging edge by using the break-out pads on the bottom of the lifting arms as a ground support or fulcrum.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

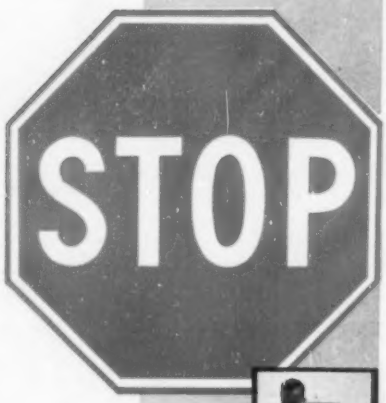
THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Illinois
Send data on 4-wheel-drive "PAYLOADER" tractor-shovels as checked.

- ☐ Model HO (2¼-yd. payload, 1¾-yd. struck)
- ☐ Model HH (1¾-yd. payload, 1½-yd. struck)
- ☐ Model HU (1½-yd. payload, 1-yd. struck)

Name _____
Title _____
Company _____
Street _____
State _____
City _____
85

ATTENTION! BUYERS OF TRAFFIC SIGNS...

here's the QUALITY TRAFFIC SIGN YOU CAN BUY AT 1/2 THE COST of ORDINARY SIGNS



GRACE 'EZ-ON' SIGN FACES

Slip 'EZ-ON' Face over old sign. Crimp wide flanges with crimping tool. That's all there is to it!

APPLY IN LESS THAN 5 MINUTES RIGHT OVER YOUR PRESENT SIGNS

THEY'RE REFLECTORIZED

WRITE FOR FULL INFORMATION

Made in 2 shapes, 2 sizes. Octagon, 24 and 30 in.; Diamond, 24 and 30 in.; Colors, red and white or yellow and black. Standard copy or special. Proven by five years actual usage.

AGENTS WANTED

GRACE SIGN & MFG. CO.
3601 S. Second St.
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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Can You Top This?

Smyth v. City of St. Joseph, 297 S.W. (2d) 578, a Missouri case decided Jan. 7, 1956, was an action by Alice Smyth against a municipality for damages caused by her fall on a recently resurfaced street.

The City had, by its contractor, recently resurfaced part of Felix street, including a certain intersection, applying about 1⅓ inches of new surface. This created a raised portion of the street at the intersection where the plaintiff was crossing. This condition had existed for several days.

As she was crossing the street, looking at the traffic light, she stubbed her toe on the raised portion of the new street surface and fell. A police officer came and assisted her to her feet and to the corner. From there she saw plainly the "rise" in the street which had been her downfall.

As a result of the broken shoulder she received in the fall, she recovered a judgment for $4,500. The appellate court upheld this judgment, on the ground that the city had created a dangerous condition and had given no warning of it, and that the plaintiff could not be said to have been contributorily negligent as a matter of law.

What Happens When Your Lid Flips

Taverna v. City of Hoboken, 128 Atl. (2d) 11, a New Jersey case decided Dec. 31, 1956, was an action against the City of Hoboken by a pedestrian who was injured by a manhole cover of the city sewer system.

About 20 years ago, the City of Hoboken cut a manhole in a public sidewalk to permit entrance into the sewer. The hole was closed by a removable metal cover which, when in place, was flush with the surrounding sidewalk. It was not locked but remained in position through its own weight. The cover rested on a metal frame which was built into the surrounding granite section of sidewalk and which extended inward one-half to three-quarters of an inch.

During the morning of November 9, 1953, Charles Taverna, while walking along the public sidewalk, stepped on this manhole cover. As he did so, it "flipped" out of position, causing him to fall part way into the manhole and suffer injury.

Witnesses at the trial testified that the manhole cover had been "wobbly", "loose", and "shaky" before the accident. The proof showed that immediately after the accident, the circular lip on which the cover rested was beveled, i.e. sloping downward; the stone around it was worn and there was a crack in the stone leading from the lip of the hole clear across the sidewalk.

There was evidence that the manhole had been inspected earlier during the year, so that the city at least had constructive notice of the dangerous condition.

The Superior Court of New Jersey, reversing the trial court, held that the evidence of the city's negligence was sufficient to go to the jury for decision, and ordered a new trial.

Water on Tap No Good in Tavern

Yulis v. Borough of Ebensburg, 128 Atl. (2d) 118, a Pennsylvania case decided Dec. 28, 1956, was an action against the borough for negligent construction of a storm water sewer.

Prior to 1948, the land was drained by an open ditch which had a small clay pipe in it. In 1948 the borough, with its own employees, constructed a storm water sewer through land subsequently acquired by Yulis. The terminus of this line was at a seepage pit five to seven feet in length. Water was conveyed

...on every oil-road conditioning job

Here's how an Allis-Chalmers FORTY FIVE motor grader reworks heaved and rutted oil roads—just one of many jobs it handles from rough grading to finish work:

Complete material breakup as 11 properly spaced teeth rip a 46-in. swath in one pass.

Full penetration with plenty of weight on front wheels and sufficient scarifier pressure to keep teeth in the ground.

Material is mixed thoroughly in fewer passes because of the live, load-rolling action of the ROLL-AWAY moldboard.

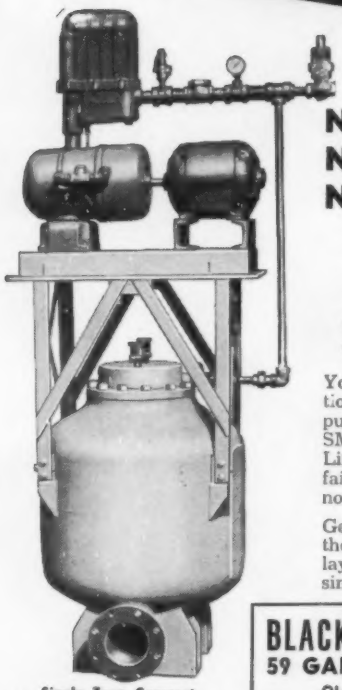
There's plenty of power for scarifying—plenty of speed for mixing. Economical 120-hp engine features day-after-day dependability on all grading jobs.

Your Allis-Chalmers construction machinery dealer has complete facts. Let him show you an actual demonstration. Call him today. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ROLL-AWAY is an Allis-Chalmers trademark

ALLIS-CHALMERS *Engineering in Action*

NO! NO! NONE!



Single Type Compact Self Contained Ejector System

NO *Complex Piping* .... **NO** *Screens*
NO *Impellers* ..... **NO** *Shredders*
NO *Costly Pump Cleaning*

WHEN YOU USE

BLACKBURN-SMITH Sewage Ejectors

You save money all along the line, on installation, operation or maintenance costs when you put in automatically controlled BLACKBURN-SMITH PNEUMATIC SEWAGE EJECTORS. Lift sewage 150 feet at 30 to 50 gpm without failure, mess or big bills. Rugged. Simple. Economical. Sanitary.

Get the facts! Write for Bulletin S-50 showing the application, advantages, dimensions and layouts of B-S Pneumatic Sewage Ejectors for single or duplex systems.

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PAT. NO. 2333273

THE BEST TRAFFIC CONTROL SYSTEM

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TWO PIECE
sliding or screw type cast iron valve boxes for covering 4" thru 10" valves for water or gas. Rugged construction for lifetime service. 5¼" shaft. Extensions as required.

Adjustable
VALVE BOXES
THREE PIECE

valve boxes supplied with separate bases are available in sliding or screw type. Made with 5¼" and 7" shafts with extensions as required. Complete line of service and roadway boxes.

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APCO

from the end of the seepage pit by the original small pipe to the main drain at the State Highway.

The plaintiff, not knowing of the existence of the storm water sewer, constructed a two-story cement block building over it, and conducted a tavern business on the first floor of the building. On May 30, 1953, during a heavy rainfall, the water erupted through the floor of the building, causing damage to the building and fixtures. Investigation disclosed that the water came from the seepage pit which had been covered with large stones and ground. Plaintiff contended that the borough had negligently constructed the storm water sewer in that it had failed to connect the new line with the old line.

The Superior Court of Pennsylvania affirmed a jury verdict for plaintiff, holding that municipalities are liable for negligence in the construction of sewers or for failure to keep the work in repair after it is completed.

This holding is in accordance with the weight of authority in other jurisdictions.

• • •

Army Medical Service Corps Commissioning Program

A Medical Service Corps Reserve program for the fiscal year 1958 for appointment and/or call to active duty in the MSC Reserve, of individuals in scientific, technical and professional specialties has been announced. Reserve commissions will be offered to qualified applicants generally for an initial period of active duty for three years. Skills include: medical administration, finance, law, pharmacy, medical supply, personnel and general business administration, sanitary engineering and accounting.

The grades offered will be from second lieutenant to captain. Applicants with prior service and company grade MSC officers of the Reserve components not on active duty may also volunteer for active duty under the provisions of this program.

College seniors may also make application for appointment in the required specialties if they are within four months of receiving their degree. Actual tender of appointment in such cases will be withheld until documentary evidence of attainment of degree is received.

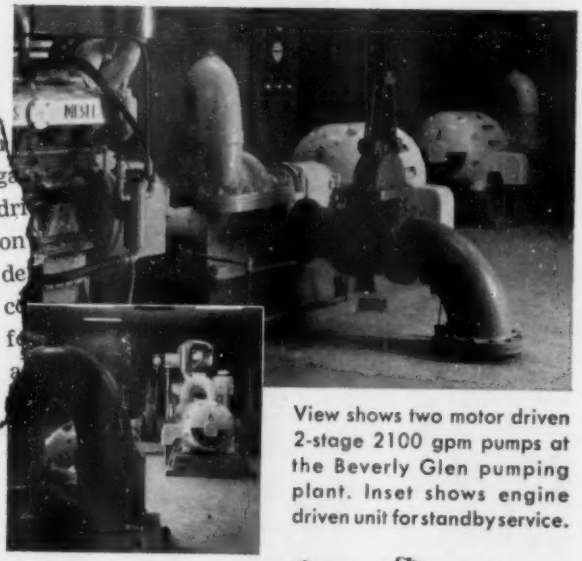
For details and application forms write the commanding general of the Army area in which you reside, your military district commanders or the Reserve unit local adviser.

PUMPING HEADlines

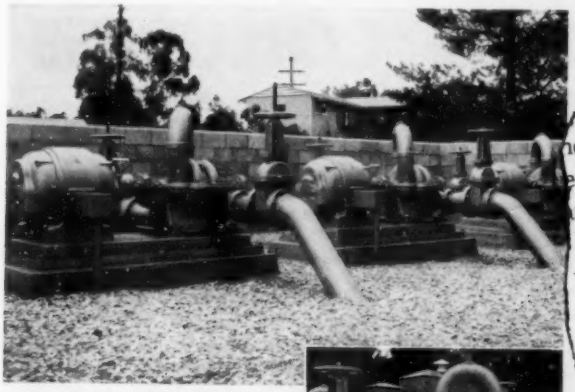
By Peerless Pumps

ON THE JOB FOR THE LARGEST MUNICIPALLY-OWNED UTILITY IN THE UNITED STATES—THE DEPARTMENT OF WATER & POWER OF THE CITY OF LOS ANGELES—PUMPING FROM RESERVOIR LINES INTO ELEVATED TANKS

510 FEET is the lift imposed on these 2-stage Peerless pumps. Two of the three 350 hp motor driven units can handle up to 6,000,000 gallons a day from inlet lines into an elevated storage tank of 2¼ million gallons capacity. The third unit, an engine driven pump, also rated at 350 hp, comes on in case of power failure and pressure demand. All three pumps are automatically controlled, starting and stopping being effected by pressure and flow controls. Pumps are designated as Peerless Type 8TU17.



View shows two motor driven 2-stage 2100 gpm pumps at the Beverly Glen pumping plant. Inset shows engine driven unit for standby service.



View shows outdoor all-weather installation of three motor driven 2-stage 1125 gpm pumps at Girard-Woodland pumping plant.

245 FEET is the head on these three Peerless 2-stage Type 5TU15 pumps. Like the units above, these pumps also handle water from a reservoir inlet line, lifting it into an elevated tank, in this case of 1 million gallon capacity. The three pumps have a capacity of up to 3,000,000 gallons a day.

For dependable, efficient pumping select and install versatile Peerless horizontal centrifugal pumps.

Mail the coupon below for illustrated and descriptive Bulletin.

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FOOD MACHINERY AND CHEMICAL CORPORATION
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Distributors in Principal Cities.
Consult your Telephone Directory.

☐ *Please send me Peerless Pump Bulletin No. B-1400*

NAME_____ COMPANY_____

ADDRESS_____ CITY_____ STATE_____

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1313 East 60th Street, Chicago 37, Illinois

DIG TRENCH LOAD SAVE

...with one fast-to-the-job Oliver!

Think of it! A *one-man* machine to handle all kinds of excavating and trenching jobs. That's exactly how cities across the country are cutting costs with the Oliver Super 88 Hydro-Trencher.

This advanced compact machine travels with rubber-tired ease over busy streets and work all those tight, awkward places. Yet, there is nothing small or limited about the variety of tough jobs it handles. There's a full 49.81 drawbar horsepower with six forward speeds.

With the ½-yd. Oliver 88 Hydro-Trencher, you're equipped for fast, continuous ditching or delicate line repairs. Powerful hydraulic down pressure, deep 12-ft. working range and 170° bucket rotation get jobs done in a hurry while savings mount.

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Whatever your digging and loading requirements, by all means investigate the Oliver Super 88. Your choice of gasoline or diesel engines. See your Oliver Industrial Distributor for a demonstration.

OLIVER **THE OLIVER CORPORATION**

400 West Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors and matched allied equipment

You Name The Service Condition...

AMERICAN CAST IRON PIPE

A wide variety of pipe sizes and joints for every service condition is manufactured by the American Cast Iron Pipe Company. 30" American Double-X Mechanical Joint Pipe is shown here.

This 30" American Cast Iron Pipe was installed to serve the plant of a New Jersey manufacturer. An intake line, it supplies raw condenser and process cooling water from the Hudson River at the rate of 10,000 gpm.

Installations such as this serve both public and privately owned utilities and manufacturers throughout the country. In these installations, conducting a wide variety of liquids, slurries, and gases, American Cast Iron Pipe has established a record of trouble-free, economical service unmatched by pipe made of any other material.

When your installation requires strong, corrosion-and-wear resistant, long lasting pipe, designed and manufactured to fit a specific service condition, call your American Cast Iron Pipe Company representative. He can help you.

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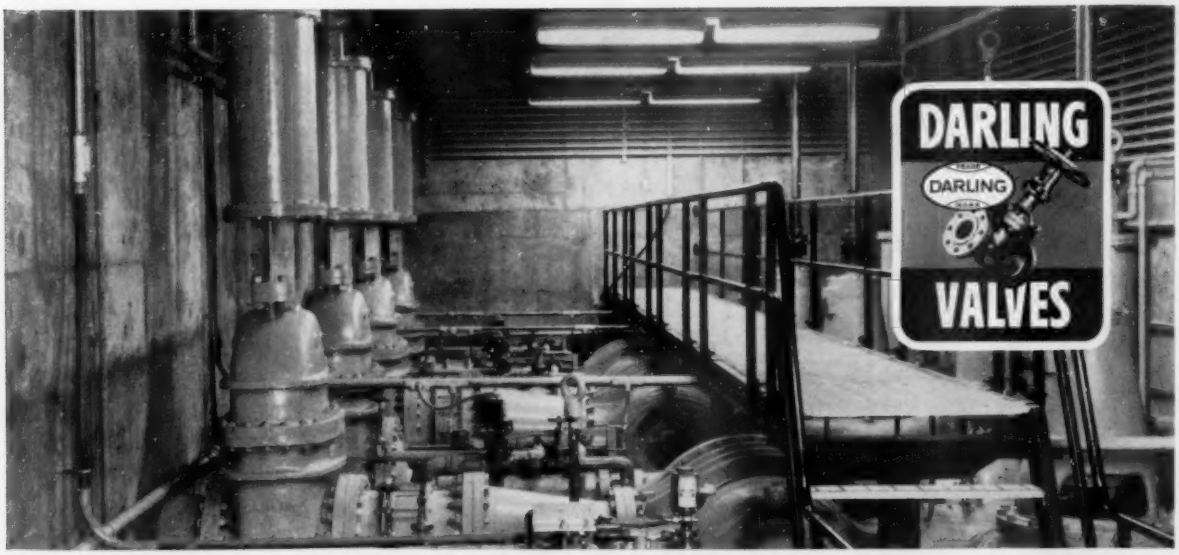

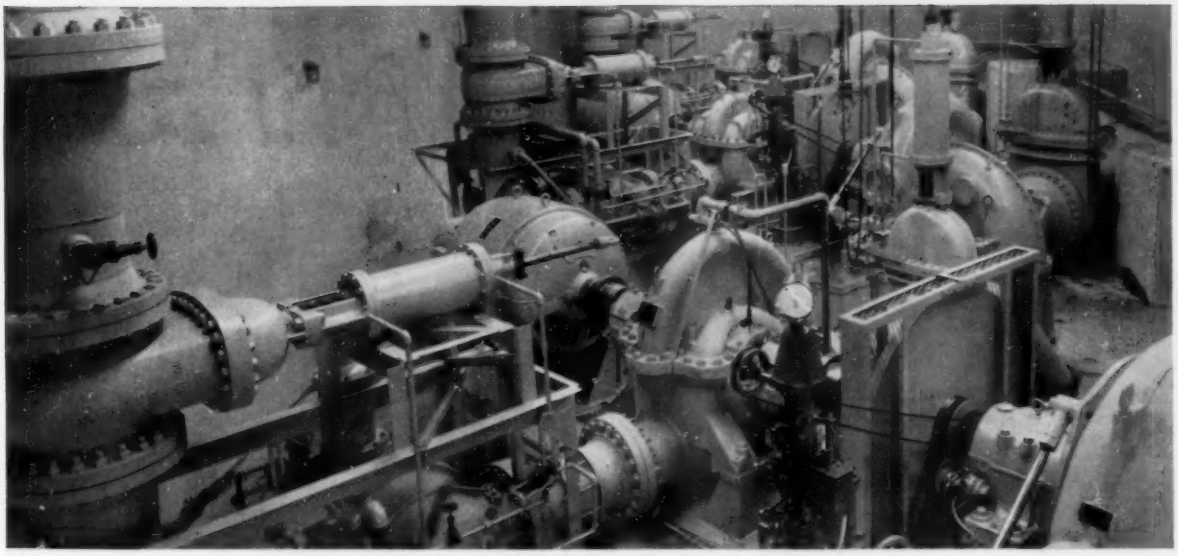

DARLING VALVES . . . *where top performance is a keynote*

MODERN planning and the latest in equipment facilities comprise a high efficiency team at the Washington Suburban Sanitary Commission's new Anacostia Sewage Pumping Station.

Note that the large Darling gate valves are cylinder operated and installed in both horizontal and vertical lines. These valves, with their fully revolving double disc parallel seat design, are particularly suited for such service. Not only are the seat faces automatically wiped clean during each operation, but the principle also assures uniform wear distribution, extended life and consistently tight closure.

Darling gate valves are available in a wide range of sizes and types for all normal and unusual services. Write for Bulletin 5403.

DARLING VALVE & MANUFACTURING COMPANY

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

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Wherever you are, the benefits of rugged, powerful Asplundh Chippers are conveniently available for you to see and experience, for there's an Asplundh representative nearby. And he is fully trained and equipped to provide you with up-to-date concepts in brush disposal.

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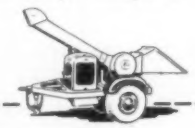
Asplundh Chippers are fully guaranteed against defective materials or workmanship. Complete and satisfactory performance is positively assured.



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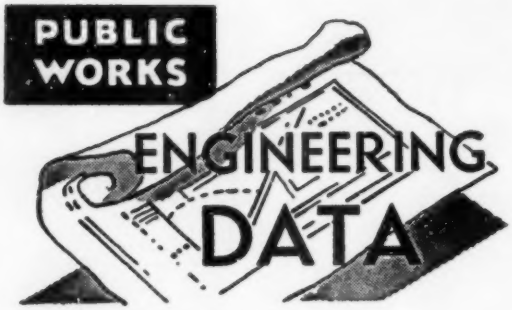
BY ACTUAL TEST THE FASTEST CHIPPER MADE



Backhoe Saves Sewer Trenching Costs

The Sewerage Division, Dept of Public Works, San Diego, Calif., recently leased a heavy duty backhoe for a six-week period to obtain factual information on the adaptability of the unit to sewer main and lateral trenching activities. The unit was tested in several sections of the City, and in the various types of soil usually encountered in trenching operations. Accurate records were maintained on all costs involved in doing the job with the backhoe. These were compared with the cost of doing similar jobs manually.

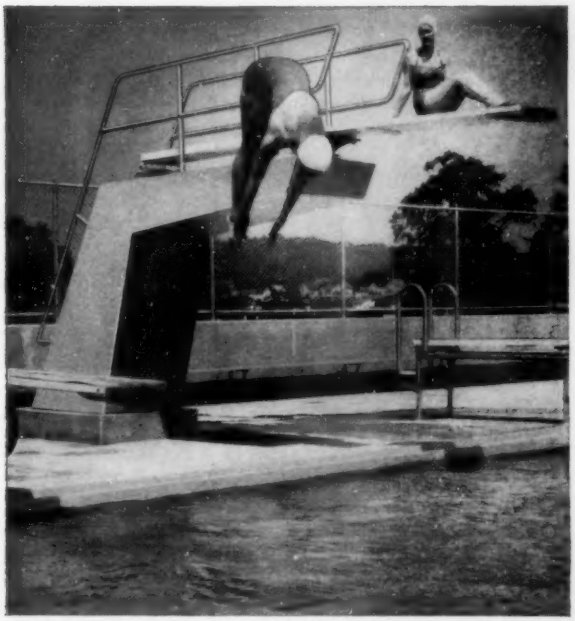
Final results of the test indicate the following:

1. The backhoe will dig an average of about three cubic yards for every cubic yard dug by hand.
2. The need for having a compressor on the job is significantly reduced. The savings from reduced compressor usage alone will cover the anticipated rental cost of the backhoe.
3. Use of the backhoe results in smoother trench walls, facilitating shoring and improving safety on this job.
4. The backhoe can be used to advantage for occasional backfilling and spoil pickup.
5. The backhoe can sometimes be used for construction of a temporary rough road to sewer mains otherwise inaccessible because of rough terrain.
6. Based on a work program for the next fiscal year of about one mile of sewer main to be repaired or renewed, and approximately 1,400 laterals to be installed, use of the backhoe will result in an annual savings of approximately $15,000.

Federal Aids in Community Water Development

The Water and Sewerage Industry and Utilities Division, Business and Defense Services Administration of the U. S. Department of Commerce, through Walter L. Picton, Deputy Director, has summarized the Federal aid programs authorized by Congress to assist communities in financing and constructing essential public water works.

Public Facility Loans.—The Community Facilities Administration of the Housing and Home Finance Agency has been authorized under the Housing Amendments of 1955 (Public Law 345) to provide loan assistance to State and local governments for building essential community facilities, including works for the storage, treatment, purification, and distribution of water; and sewage, sewage treatment, and sewage facilities. However, to obtain such loans, financing must not be otherwise available at reasonable terms. Such loans must also be of sound value and so secured as reasonably to assure retirement or repayment. Communities of

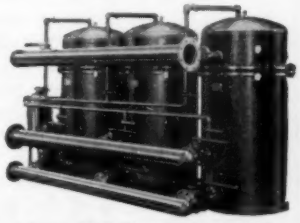


The 621,000 gallons of water in the Mack Community Center swimming pool at Indiana, Pa., can be filtered three times a day — another example of how high capacity Adams filters protect the health of swimmers across the nation.

Here's why the finest pools have R. P. ADAMS SPF filtration!

When you buy Adams filtration for your pool, you get a complete package . . . there's no divided responsibility for performance. Then, the entire system is designed for ease of operation and maintenance. What's more, you get the most advanced filter design offered — using diatomaceous filter aid and permanent Poro-Stone elements. Write for the full details today.

R. P. Adams filters are used to maintain the shimmering clarity of the new Y. W. C. A. pool in Buffalo, New York.



Adams SPF filters are ideal for community pools like that illustrated above. This triple SPF 169 can handle pools up to 730,000 gallons capacity.

R. P. ADAMS CO., Inc.
228 East Park Drive, Buffalo 17, N. Y.

SAW CONCRETE & ASPHALT *FASTER* WITH THE *ALL-NEW*

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36 H. P. CONCRETE SAW

Over 36 Outstanding Features Found on No Other Concrete Saw!

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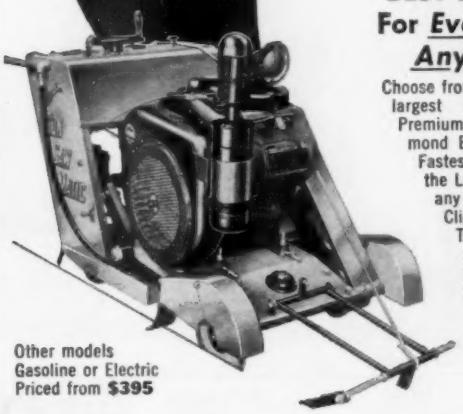

Other models Gasoline or Electric Priced from **$395**

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Choose from the world's largest selection of Premium Quality Diamond Blades for the Fastest Cutting at the Lowest Cost on any job. Let your Clipper Factory Trained Representative help you select the right Saw and Blades for your job!

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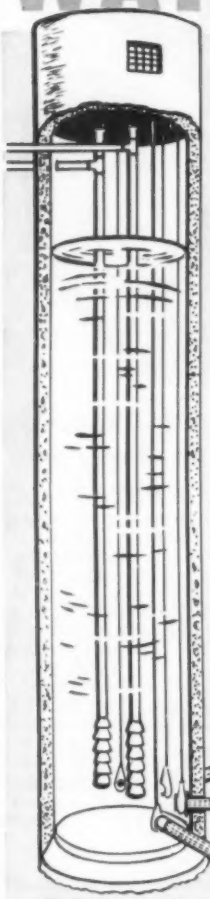
24 years . . .
WATER-WISE



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Profit by doing the job right

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from Canton to Boise . . .

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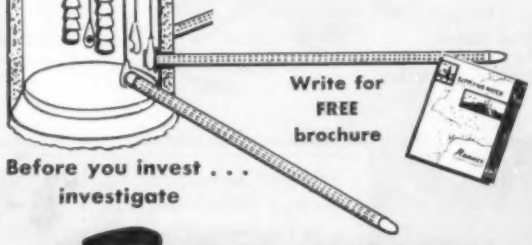
- Knowledge
- Efficiency

Ranney welcomes the opportunity to work with your consultants on any of your water problems.



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less than 10,000 population will receive priority consideration.

Advanced Planning of Public Works.—This same agency has also been authorized under Public Law 560, as amended, to advance funds to States and municipalities to help finance the cost of the planning of various public works, including water supply facilities. These advances are repaid to the Federal government, without interest, when construction is started or contracts are awarded.

Grants for Construction of Treatment Works.—Under the new Water Pollution Control Act (Public Law 660), the U. S. Public Health Service (Water Supply and Water Pollution Control Program) has been authorized to make grants for construction of sewage treatment plants. As enacted, the law provides for the appropriation of $50 million each year up to an aggregate of $500 million for grants to any State or municipality for the construction of treatment works. Individual grants for any project cannot exceed 30 percent of the estimated reasonable cost of the project or $250,000, whichever is smaller. Also, 50 percent of the funds appropriated for any fiscal year must be used for grants to municipalities of 125,000 population or under.

Reclamation Project Programs.—The Bureau of Reclamation, Department of the Interior, carries on a program of reservoir and irrigation project construction and operation in the 17 Western States. Most of these projects are multipurpose and may include provision of municipal and industrial water supply for communities located within the project area.

The *Small Reclamation Projects Act of 1956* provides for Federal assistance in the development of small irrigation projects by State and local governments in the 17 western States. Under provisions of the Act, Federal loans are applicable for development of the irrigation portions of the project while grants are made only for those portions of the project dealing with development of navigation, flood control, and/or fish and wildlife preservation. The local organization pays for all land rights in land, and water rights. Single-purpose municipal water supply projects are not authorized under the Act, but water supply may be included as part of a multipurpose irrigation project.

Army Civil Works Programs.—The Army Corps of Engineers carries on an extensive program of flood control and navigation projects. Collateral benfits of this civil works function of the Corps include provision of water for municipal and industrial water supply. Under present authority the Corps may modify reservoirs to provide additional storage for water supply on condition that local interests pay the costs of that storage, and to make contracts with States and municipalities for surplus water that may be available at Civil Works projects.

Further information on these Federal-aid water supply programs may be obtained direct from the Washington office of the agency concerned, or from the Regional or District Office of these agencies, serving the area in which a project is located.

Agriculture Watershed Programs.—The Department of Agriculture, primarily through the Soil Conservation Service, is responsible for a number of water programs, including water conservation. These are administered largely through the local soil conservation districts and involve direct Federal programs and state appropriations and grants.

HERE'S BIG-GRADER PERFORMANCE
. . . *economy size*

The Allis-Chalmers Model D is a full-fledged motor grader . . . and a "natural" for road construction and maintenance jobs where fine grading performance and low cost are both important!

It has the basic design and performance features found in machines costing up to three times as much, but there is one important difference: The Model D is compact and maneuverable enough to work in crowded areas where many other graders cannot operate.

To add still further to its usefulness, the Model D may be equipped with a rear-mounted, ⅝ cu-yd loader, scarifier, shoulder maintainer, leaning front wheels, power circle turn, shiftable moldboard. Optional cab offers year-round operator comfort.

Let your Allis-Chalmers dealer show you how the Model D can measure up to your standards of grader performance . . . at low cost. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS *Engineering in Action*

. . . ample power to rip through tough roots and earth formations . . . full speed and torque right up to stalling point . . . safer to operate than engine or electric drives.

FASTER Pipe Installation — LESS WASTED TIME

WRITE FOR BULLETIN

HYDRAUGER*

*REG. U.S. PAT. OFFICE

HYDRAUGER CORP, LTD.
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Y-33A

Does bituminous paving or patch-work

Kwik-Mix bituminous mixers combine rubber-tired portability with big production capacity for paving roads, walks, parking areas, tennis courts, play grounds — and repairing busy streets, rail crossings. On patch-work, convenient end discharge permits direct pouring into pavement-break. On continuous paving operation, mixer can be towed by truck (from which materials are supplied) and discharge the mix in windrows for spreading and rolling. 10 cu. ft. mixer can produce up to 22 tons per hour (based on 1½-min. mixing cycle, and aggregates weighing 110 lbs. per cu. ft.). On same basis, 14 cu. ft. mixer averages 30 tons hourly. See Kwik-Mix distributor or send for bituminous mixer catalog.

mail to: KWIK-MIX COMPANY, Port Washington, Wis. (Koehring Subsidiary)

Send us literature on: ☐ 10 ☐ 14 cu. ft. bituminous mixers.

NAME .....

TITLE .....

ORGANIZATION .....

ADDRESS ..... KM673 PW

Under the *Small Watershed Act (Watershed Protection and Flood Prevention Act of 1954, as amended in 1956)*, the Department of Agriculture is authorized to provide loans and grants to local governments in the development of small watershed areas. Such projects, however, must first have the approval of a State agency designated by the Governor. The Federal Government reimburses the local government for the total cost of installing works applicable to flood prevention and shares in the cost of other agricultural watershed management. Municipal water supply may be included as part of a multipurpose project but not as single-purpose projects under existing Department policy. Local organizations pay for all land, easements, and rights-of-way, and for installing municipal water supply facilities, for which interest-bearing loans may be obtained upon application.

Welded Bridges for Interstate and Defense Highways

A $50,000 award program on welded bridges for interstate and defense highways is being sponsored by the James F. Lincoln Arc Welding Foundation. The objective of this program is to serve the national interest by encouraging the creation of bridge designs which will save steel and money, but which will incorporate attractive features that produce structures of aesthetic appeal, and safe, efficient performance.

The scope of this program is not limited to any specific site, conditions, or dimensions. The single limitation is the general one that each bridge design entered in this program shall be a highway bridge that is now, or is eligible to become, a structural part of the national system of interstate and defense highways.

For full information on this program write The Secretary, The James F. Lincoln Arc Welding Foundation, P. O. Box 3035, Cleveland 17, Ohio.

Patent Infringement on Sewage Treatment

The United States District Judge for the Southern District of Texas, Houston Division, entered judgment on April 2, 1957 in the suit filed December 20, 1955 by the Chicago Pump Company against the City of Baytown, Texas. The decree held Chicago Pump Company Patent No. 2,532,457 for the Aerated Grit Removal Chamber valid and infringed by a grit removal installation owned by the City of Baytown.

Chicago Pump Company licensed this use for the particular Aerated Grit Chamber owned by the City of Baytown, Texas. Over 150 licensed Aerated Grit Chamber installations have been made by various municipalities throughout the country on this patent since 1950.

Digester Gas Utilized at Marion Plant

Digester gas is utilized at the Marion, O., sewage treatment plant. During 1956, 2,154,000 cu. ft. of gas were produced and 1,987,000 ft. were utilized. At the estimated market value of gas per thousand cubic foot, this represented a saving of $1,001.70; and 72 percent of the total power requirements were furnished by the gas. Two of the aerator blowers are driven by engines fueled with digester gas. Gas production is increased by grinding up to 6 tons of garbage per day, the grinder being installed at the treatment plant. Raymond Strickland is plant superintendent and Gordon Watson is superintendent of Marion City Utilities.

Before you buy any tractor equipment...

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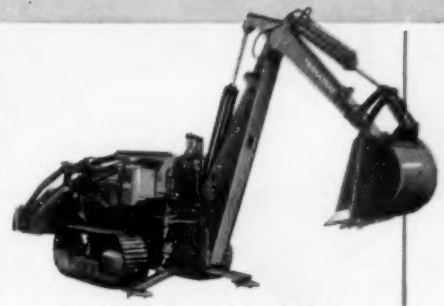
PRICE AND PERFORMANCE!

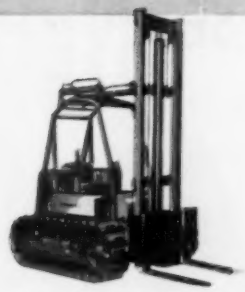
Crawler-mounted loaders

Five sizes — ½ to 2-cu yd. — with exclusive "knock-out" dumping action, plus improved bucket rollback. Extra-high dump clearance simplifies loading high trucks and hoppers.



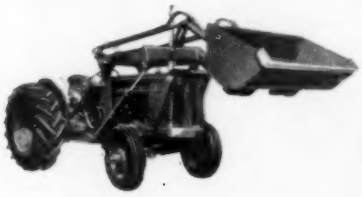
Crawler-mounted backhoes

Exceptional power and stability for tough digging in hard ground, steep grades, etc. Digs 12½' below grade. Available with various dipper sizes and optional front-end loader or dozer.



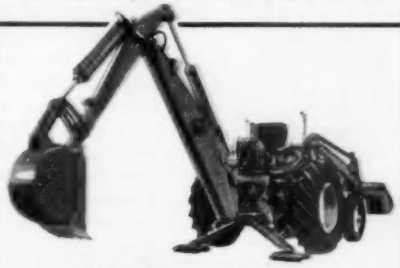
Crawler fork lift

Keeps jobs moving in any weather or terrain. Unloads trucks... carries, lifts materials to 21'4" height. Mounts quick-change loader, dozer, concrete bucket, log-grab, or crane hook.



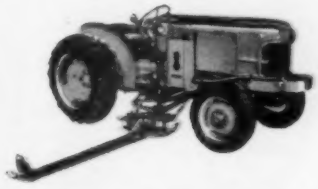
Wheel-type loaders

Beats any ½-yd. loader you ever saw for light loading, backfill and clean-up. 100% Case-engineered, Case-built, with heavy-duty lift-arms and automatic power-leveling.



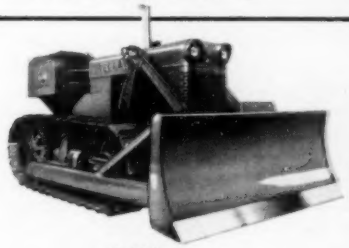
Wheel-type backhoes

Lowest-priced combination backhoe-loader on the market. Heavy-duty industrial design, with hydraulic foot-controlled 180° swing, telescoping stabilizers, many other advanced features.



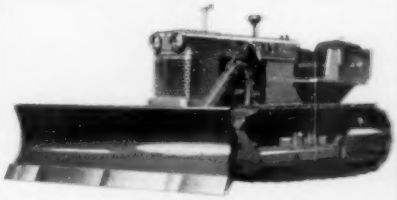
Rubber-tired prime-movers

Three economical sizes — 42, 60 and 100 HP — with high-torque Case engine for operating mower, grader blade, etc. Also ideal for miscellaneous winching and drawbar work.



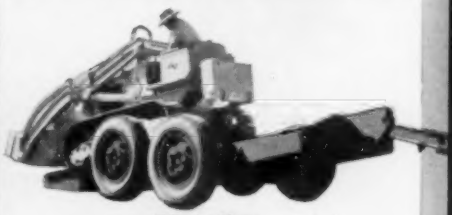
Bulldozers

Seven low-cost models under 80 HP — four with torque converters — plus larger sizes up to 100 HP, with max. 24,000 lbs. drawbar pull. Largest models feature optional "power-tilt."



Angledozers

Eleven gasoline and diesel-powered models from 42 to 100 HP. Largest models have torque-converter drive, instant power-shift, power steering—plus exclusive "power-angling" blade.



Tilt-trailers

4 or 8-ton capacity. Easily loaded or unloaded by one man. Available at saving of $500 to $1000 under competitive trailer prices with purchase of new TerraTrac crawler.

Maybe you didn't realize it... but J. I. Case Company now builds the *most advanced* line of industrial tractors and equipment of any single manufacturer in the 40 to 100 HP range. You can choose from a complete family of new Case-built prime-movers — *both wheel-type and crawlers* — plus a full line of matching loaders, bulldozers, backhoes, fork lifts and trailers. There's a rig for every need and budget — with just *one warranty, one service source, one easy financing arrangement,* on each complete machine. See your nearest Case Industrial Dealer for full details.

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☐ Wheel loaders ☐ Wheel-type backhoes ☐ Rubber-tired prime-movers ☐ Bulldozers ☐ Angledozers ☐ Tilt-trailers

Name _____ Position _____

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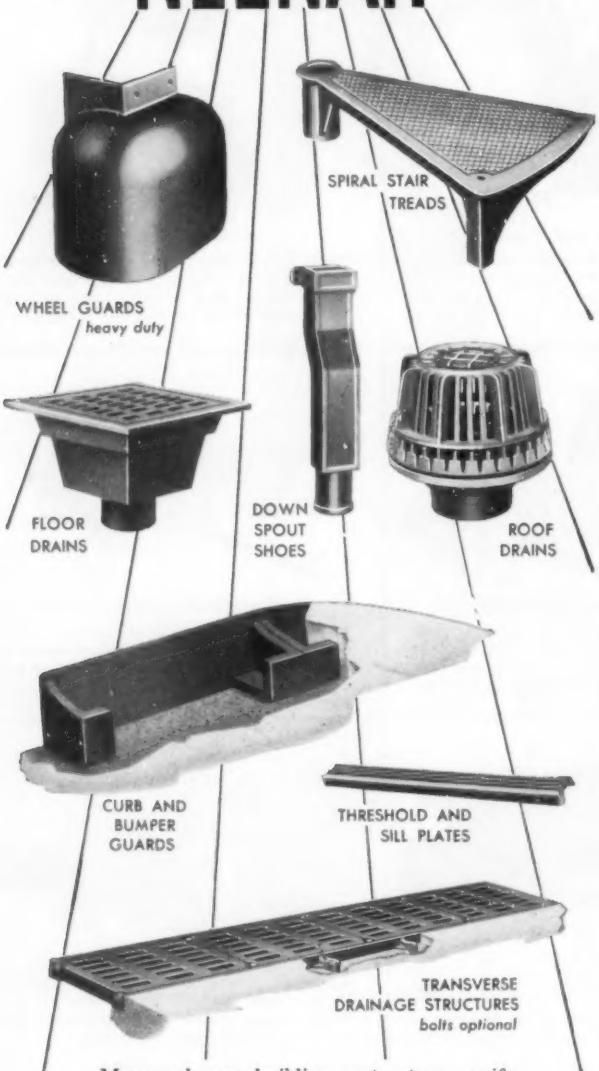

More and more building contractors specify NEENAH fine quality construction castings FIRST. The Neenah line also includes manhole frames and covers, catch basin inlets and many other items to meet any construction requirement. Write today for your free copy of Catalog "R," second edition: 140 pages with pictures and description.

NEENAH FOUNDRY COMPANY

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Chicago Office 5445 N. Neva Ave., Chicago 31, Ill.

New York Requires Pretreatment Of Some Industrial Wastes

The additions to the Bowery Bay sewage treatment plant of New York City began operation about June 1, bringing total plant capacity to about 40 mgd. Regulations require pretreatment of waste products which might "injuriously affect the treatment of sewage; or which will injure the sewers into which they may be discharged; or which do not yield readily to the treatment employed; or which may produce conditions dangerous or prejudicial to life or health." The Department of Public Works is especially concerned with the discharge of inflammable liquids or gases, grease, oils, oil sludge, coal tar, vegetable or mineral oils or derivatives and waste products from paint manufacturing. Standards which waste products must meet are now being prepared. F. H. Zurmuhlen is Commissioner of Public Works.

Costs of Producing Tol-e-gro Increase

Increasing costs in the manufacture of fertilizer, Tol-e-gro, at the Toledo, Ohio, sewage treatment plant, coupled with a drop in sales has caused Commissioner of Sewage A. H. Niles to ask that a policy decision be made as to whether the processing of fertilizer should be continued. Total tonnage sold this past year was the lowest in the last four years for a total of 516.84 tons sold for $9,520.30. The farming industry recently has been using more concentrated fertilizers, rather than the lower analysis ones. Excessive maintenance and replacements costs involved in the manufacture of the fertilizer require that a policy decision be made as to whether this operation should be continued.

Bridges on Town Highways

There are 87 bridges of 25-ft. span and over located on town highways that are under the supervision of Columbia County, N.Y. The substructure and superstructure of these bridges are the responsibility of the county while the town is responsible for the floor system. Of these 87 bridges, 52 are modern structures capable of carrying with safety the present day loads; 21 are bridges built in the late 90's and early 1900's that are becoming obsolete. They are generally steel trusses with light I-Beam stringers with plank flooring, from 12 to 16-ft. clear width, and load capacity from 3 to 20 tons. In most cases they are serving local traffic satisfactorily. The remaining 14 bridges are in poor condition and require rebuilding at the earliest possible date. These data are from the 1956 Annual Report of the Dept. of Highways, Columbia County, New York, B. J. Kelleher. P.E., County Superintendent.

Waste Collection and Disposal Costs in Toledo

The bill for waste disposal in Toledo, Ohio, in 1956 was $109,459.82 or a per capita cost of 33 cents. Refuse collection cost $1,205,803.79 or $3.61 for each person. The street cleaning bill was $672,038.93 or $2.01 per capita and the cost of street repair was $518,301.78 or 84 cents per person. The total cost for all street division activities, according to Street Commissioner H. M. Loucke, was $2,965,807.43 or $8.88 per person.

Refuse disposal is by both incineration and sanitary landfill.

Calgon† provides a simple, effective and economical solution to these and many other water problems. Fed at rates of only a few parts per million, Calgon stabilizes iron and manganese dissolved in water, prevents iron pick-up from pipes. Where water meter stoppage or Red Water presents a problem—Calgon is the answer.

Corrosion Control with Calgon is effective in minimizing tuberculation. Mains and pipes stay clean, keeping flows high and pumping costs low.

Calgon also inhibits the formation of lime scale in both naturally hard and lime softened waters. Filters, valves, mains, heaters and meters are kept clean, because Calgon keeps scale forming minerals in solution.

Years of experience with water problems of all kinds in every part of the country are available to you. A phone call or letter will put Calgon's technical know-how to work on your particular problem.

*Calgon is the Registered Trade Mark of Hagan Chemicals & Controls, Inc. for its glassy sodium phosphate products.

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A DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY • HALL LABORATORIES

NEW!

OK CHAMPION
POWER SEWER CLEANER

Model C8-23R6 — NOW READY!

40 Years Experience designing and manufacturing sewer cleaning equipment utilized in this new model.

Safety features for operators and sewer line not found on any former model.

Automatic return to neutral position even when power control is left unattended — belt slippage for overload.

Folding arch double pinned to allow lowering to either side or removal.

Extra heavy H beam and double steel channel construction. Overall length only 74 inches. Interchange overnight cable drum from one machine to the other of the pair.

Simplicity of operation.

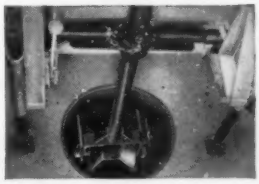
Two speeds — change from high to low in seconds — eliminates buying transmission.

Rack and pinion jack legs on front and rear end for quick and easy machine leveling and towing.

Operator removed from traffic and moving mechanisms hazards.

Novel belt and gear power transfer from engine to cable drum.

Giant in pulling power.



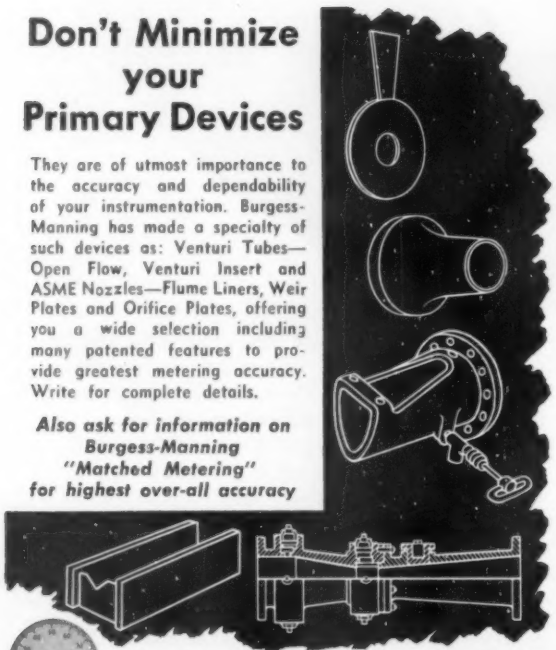
Pole suspended guide wheel mounting allows virtually 360° positioning choice and transporting without removal from machine.

CHAMPION CORP. 4752 SHEFFIELD AVENUE HAMMOND, INDIANA

Don't Minimize your Primary Devices

They are of utmost importance to the accuracy and dependability of your instrumentation. Burgess-Manning has made a specialty of such devices as: Venturi Tubes—Open Flow, Venturi Insert and ASME Nozzles—Flume Liners, Weir Plates and Orifice Plates, offering you a wide selection including many patented features to provide greatest metering accuracy. Write for complete details.

Also ask for information on Burgess-Manning "Matched Metering" for highest over-all accuracy



BURGESS-MANNING COMPANY
PENN INSTRUMENTS DIVISION
4116 Haverford Ave., Philadelphia 4, Pennsylvania

Instrumentation and Controls for water, steam, gases, sewage and industrial wastes

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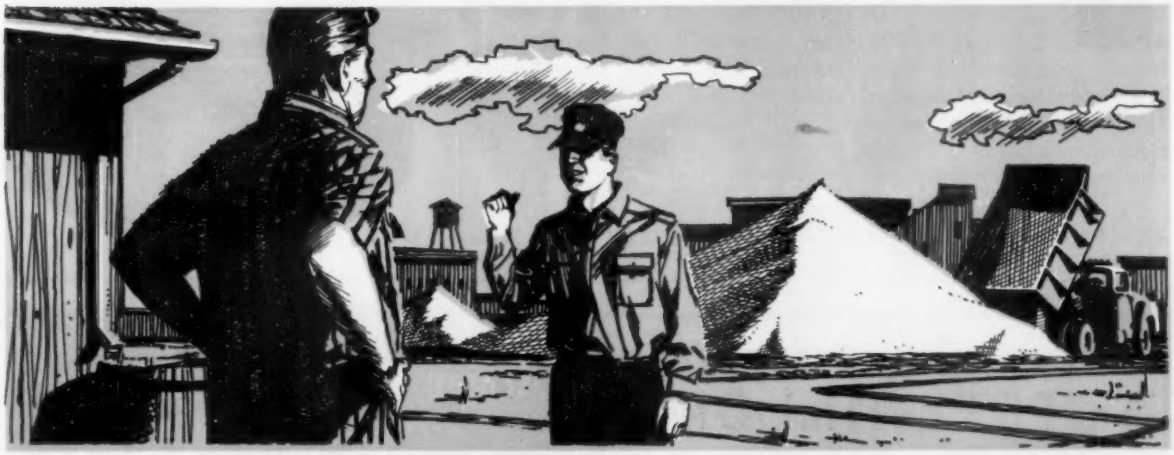

Order enough Morton Rock Salt now

Be prepared before unexpected storms ice your streets and highways. Eliminate confusion, extra work and accidents by stockpiling Morton Rock Salt now for winter ice and snow removal. Store it in unused buildings, garages, loading platforms or outdoors near key traffic points. You can do this without loss or inconvenience—and, if you wish, a Morton Consulting Engineer will be happy to advise you.

Morton Rock Salt is 8 times better than abrasives. One man and one truckload of Morton Rock Salt does a better job of ice and snow removal than 8 men and 8 loads of abrasives. Morton Rock Salt leaves no messy residue on streets, in gutters and sewers . . . needs no flushing after a thaw . . . won't blow away or leave a rutted, dirty pavement. Non-toxic, Morton Rock Salt also is inexpensive. (It generally costs far less than calcium chloride.)

Send for more information today! Fill in and mail coupon below for valuable help with ice and snow removal.

☐ *Please send me your free book on ice and snow removal.*

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with cool, refreshing drinking water

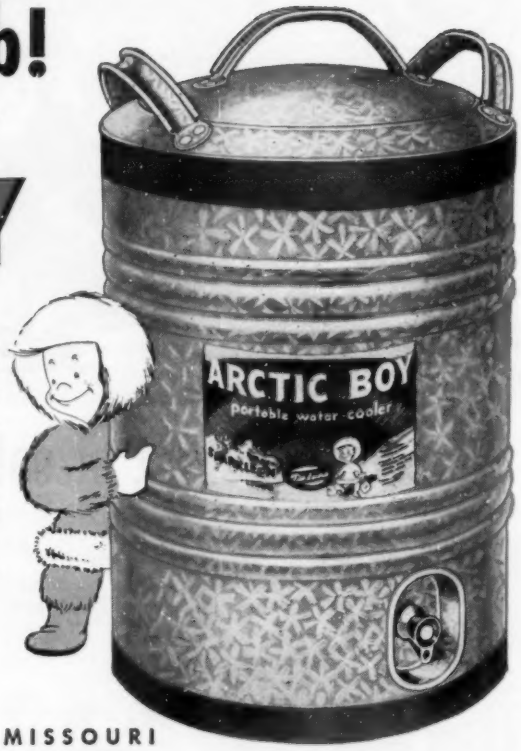
ARCTIC BOY

portable water coolers

Keep workmen on the job by keeping sparkling pure, refreshingly cool drinking water on the job.

ARCTIC BOY Coolers are big, rugged, built to take abuse. They feature double-locked seams and bottoms, brass-nickel plated recessed faucets, fully enclosed or open-rimmed covers. There's the new SPARKLEEN liner, too, that keeps water sparkling clean, odor-free and taste-free. Large opening, straight sides make them easy to ice and clean.

You'll find ARCTIC BOYS are a money-saving investment everywhere they're used.



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In your field, 100% of those who take the famous "Electronic Witch" on FREE TRIAL actually purchase it! Here is absolute proof of unsurpassed performance. Outperforms any pipe locator on the market regardless of price.

Test this new Pipe and Cable Finder under YOUR actual working conditions. State on your company purchase order that you want 10 day FREE TRIAL OFFER. Your only expense is the nominal shipping charge.

ONLY $172.50
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Send for free 1957 CATALOG. Complete Pipe Finding, Leak Detecting and Corrosion Control Equipment.

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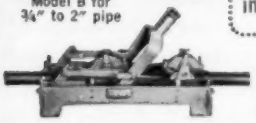
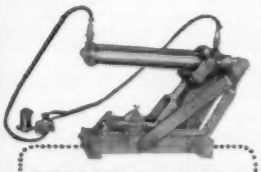
Only the Trojan Pipe Puller & Pusher

gives you continuous action . . .

No Resetting of Grip!





CUTS COSTS! SAVES TIME-
in installing or renewing pipe under pavement

The Trojan combines pushing and pulling operations in one machine—eliminates all time-killing resetting of grip—keeps pipe continuously moving. Does the job at lower cost—in far less time.

Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

Model B (either hand or air powered) needs only 5½' trench—has 3 speeds for different soils—is reversible in 30 seconds. Push pipe comes in 30" lengths, assures straight travel.

NEW AIR POWERED Model B
Does all the work for you. Handles ¾" to 2" pipe.

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Where performance is the measure

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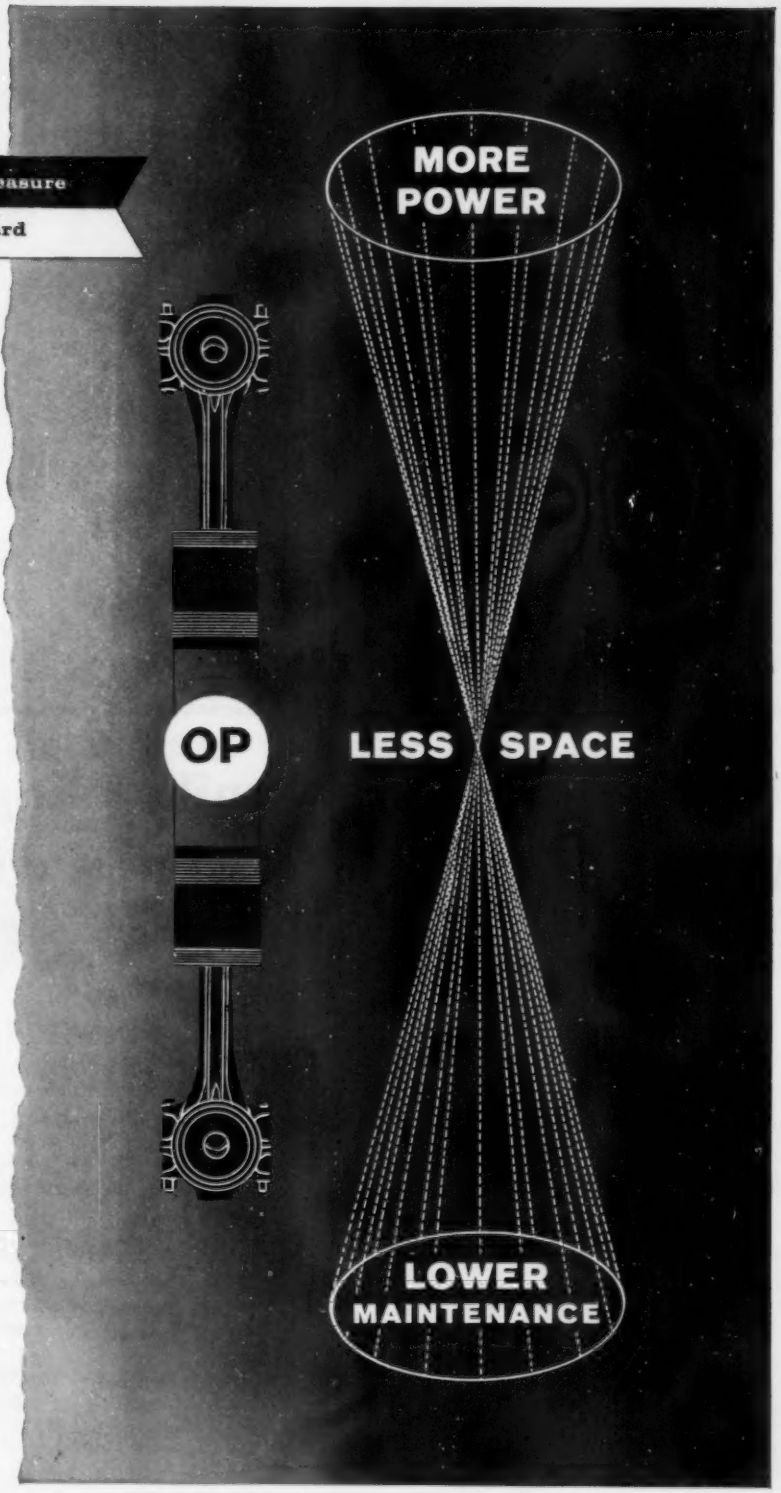

Only Fairbanks-Morse Opposed-Piston Diesels offer all these advantages:

Opposed-Pistons . . . of equal weight reacting to combustion in a single cylinder liner producing more power in less floor space with less weight—power that is instantly responsive with practically no vibration.

Two-Cycle Design . . . that completely eliminates more than 40% of the moving—wearing—parts found in engines of comparable horsepower. No cylinder heads, no valves or intricate timing with its attendant adjustments. Fewer parts automatically mean less maintenance. Low B.M.E.P. further reduces wear.

Uniflow Scavenging . . . that eliminates crosscurrents, pockets. Provides greater horsepower, increased thermal efficiency for the utmost in fuel economy.

More Dependable Power . . .
Insist on an O-P in the 200 to 2400 horsepower class and see what top performance, reliability and economy can mean in dependable power generation. For complete information to get you started, write: Fairbanks, Morse & Co., Dept. PW-7, Chicago 5, Illinois.

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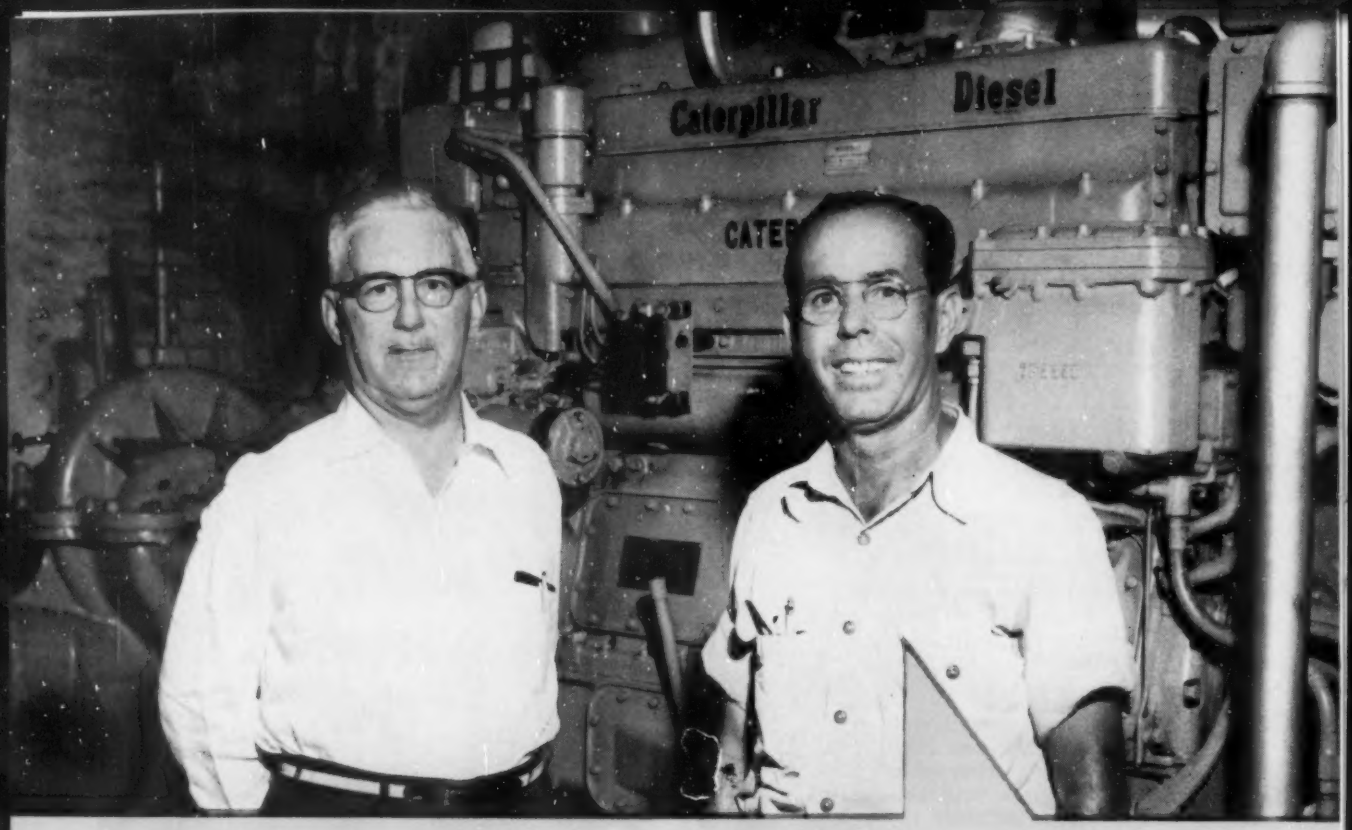

"I recommend Caterpillar Engines from my own experience with the D337"

Vincent Y. Cremata, *Superintendent*

In use every hour of every day, this CAT* D337 Engine provides steady, continuous power to a pump that supplies all the water for Key West, Florida. One million eight hundred thousand gallons are pumped daily to Key West from Florida City.

Vincent Y. Cremata, superintendent, shown at right above with Ernest A. Ramsey, manager of the Florida Keys Aqueduct Commission, tells why they chose Caterpillar power back in 1953:

"I hadn't had any experience with Caterpillar-built equipment when we got our D337. But before we ordered it we talked to the major contractors in the area. They work their engines as hard as possible—and recommend Cat Engines over all others.

"I, too, recommend them from my own experience with our D337 Engine. We have had nothing but satisfactory service and economical horsepower."

This D337 has proved itself an outstanding engine, but the new D337 (Series F) with Turbocharger is even more efficient and powerful. A compact, 6-cylinder, four-cycle unit, it has 310 HP (maximum output capacity). There are no cylinder ports to clean. And the single-orifice injection valves won't foul, need no adjustment.

The line of Caterpillar-built diesels ranges up to 650 HP (maximum output capacity)—and now includes two spark-ignition engines, the D397 and the D375, with 400 HP and 267 HP, respectively, for continuous duty. They use economical methane-type natural gas, even sewage gas, for fuel. And, of course, no expensive fuel storage tanks are necessary.

See your Caterpillar Dealer soon for complete information on these rugged yellow engines. Depend on him for expert service and reliable parts after you buy.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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A QUARTER CENTURY OF DIESEL LEADERSHIP

PUBLIC WORKS
Magazine
JULY 1957 Vol. 88, No. 7

● THE AUTHOR, Frank M. Belick, represented San Jose during construction and is now responsible for operation.

SAN JOSE'S NEW PRIMARY PLANT: *MODEL of DESIGN, Lesson in Economics*

FRANK M. BELICK

Plant Engineer,

San Jose, California

. . . Latest equipment and automatic controls are features of 54 mgd. sewage treatment facility at San Francisco Bay municipality. Seasonal peaks of cannery waste made for unusual design problems.

A NEW sewage treatment plant, flexible enough to provide both primary and secondary treatment, at least part of the time, is the latest achievement of the City of San Jose, California. Powered by three 655-hp. Enterprise dual-fuel engines, the plant is completely independent of outside power sources for its nearly automatic operation. For contrast, this new facility is served by an outfall sewer built over 60 years ago, but which has capacity matching that of the plant itself.

A contrast of another sort is the widely varying sewage load imposed upon this sewerage system by San Jose itself, its industries and its adjacent subscribing districts. The central factor, of course, is the growing population of this Santa Clara County community. A town of only 12,000 in 1880, when portions of the system were first planned, San Jose population now totals nearly 128.000. In addition, outlying districts add some 90,000 contributors to the sewerage system. Volume from these sources is about 23 mgd.

A big variable is the seasonal load resulting from San Jose's many fruit and vegetable canneries. San Jose receives, processes and ships over 400,000 tons of apricots, peaches, pears and tomatoes each year. Accordingly, sewage and industrial waste flows during the peak cannery pack range as high as 41 mgd. August and September are the heaviest months, when peach, pear, and tomato processing is in full swing.

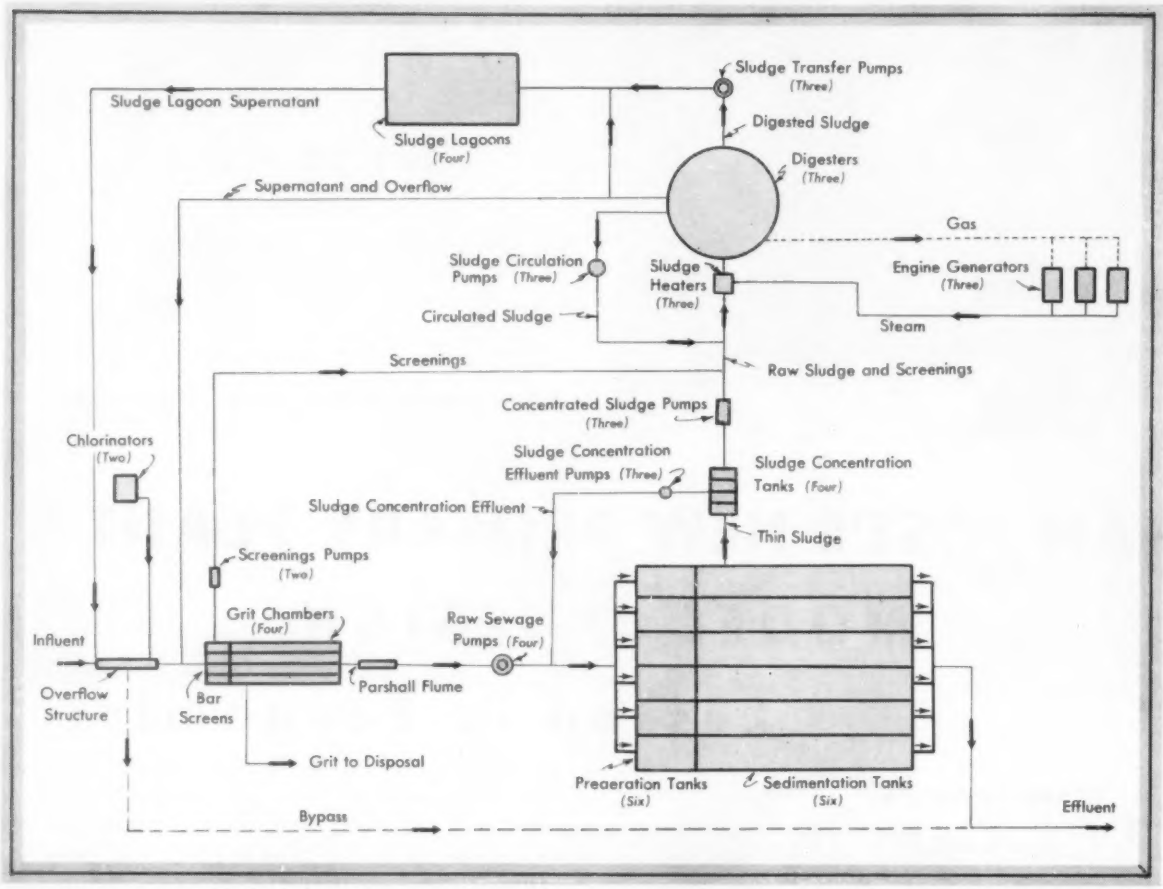
The contrasts in sewage volume and character posed both economic and design problems for San Jose officials and for their engineering consultants. The ultimate solution will be described in terms of the engineering studies made, and the facilities that have been built, and which began operation last November.

Plant Design Studies

The facilities for primary treatment were based on two criteria: The volume of liquid, and the volume of settleable or flotable material for the digesters. Studies made for the Santa Clara County Board of Supervisors in 1946 provided the basic reference information when design studies were undertaken in 1949 by Hyde & Sullivan, consulting engineers on the plant design. The 1946 recommendations called for pre-aeration, primary sedimentation and separate sludge digestion, together with secondary treatment in oxidation ponds.

The lapse of time suggested re-evaluation of quantity and quality of sewage. Also, the question of disposal of solid waste from San Jose's canneries now had an answer not previously available.

Up to 1946 cannery wastes, including all possible solids, were flushed directly into the sewer for disposal. Thereafter California's Division of Fish & Game required fine screening of wastes by each cannery, introducing a new problem of transportation and disposal of screenings.

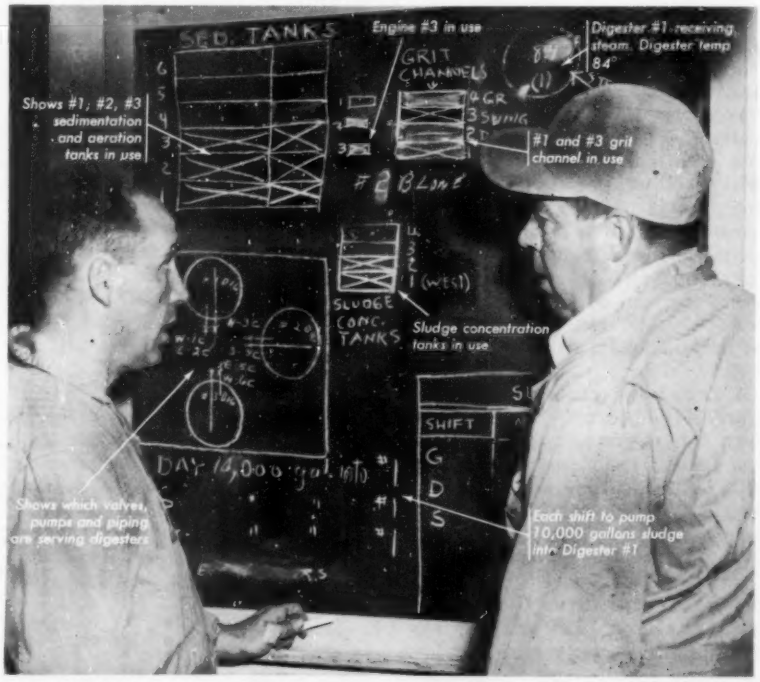


● **SCHEMATIC diagram of San Jose plant. Parentheses show the number of units of each stage as actually constructed.**

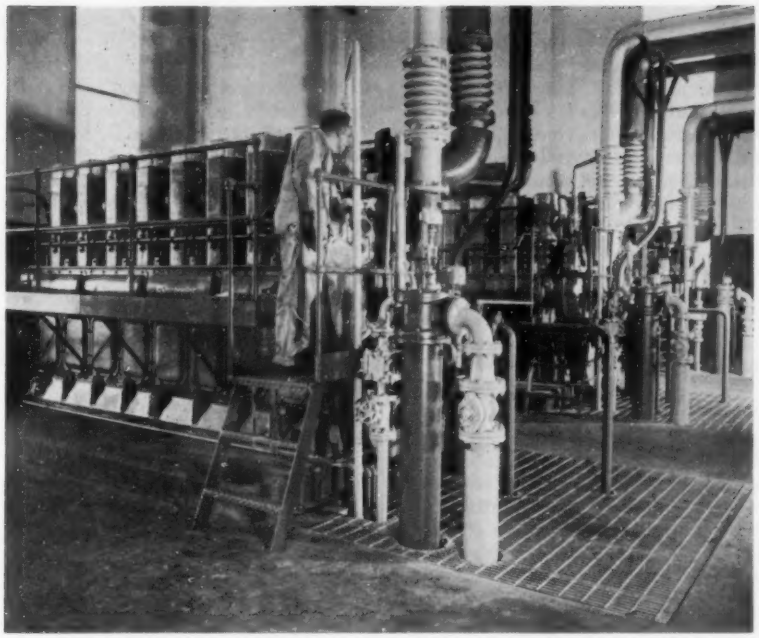
In 1949 studies were made to see if treatment plant design and operation could be provided to cope with these solid wastes. The question became one of cost, since such disposal was found physically possible. Given the alternatives of (1) discharging solid wastes as in the past, and paying for the resulting additional treatment costs; or (2) providing fine screening and disposal on an individual basis, the cannery industry chose the latter. Design could therefore proceed without the necessity of providing for large volumes of seasonal solid cannery waste.

Sewage Quantity and Quality

The 1949 survey by Hyde & Sullivan involved metering sewage flows and sampling the sewage for quality analysis at its terminus. The outfall was calibrated by both the salt velocity method and the chemical dilution method. Summer volumes were particularly studied, with reference to the volume of cannery wastes. Essential data obtained and developed during the summer of 1949 showed average week-day flow


SED. TANKS
Engine #3 in use
Digester #1 receiving steam. Digester temp 84°
GRIT CHANNELS
Shows #1, #2, #3 sedimentation and aeration tanks in use
#1 and #3 grit channel in use
#2 BLOWE
1 (WEST)
SLUDGE CONC. TANKS
Sludge concentration tanks in use
SHIFT
G
D
S
DAY 10,000 gal. into #1
Shows which valves, pumps and piping are serving digesters
Each shift to pump 10,000 gallons sludge into Digester #1

● **"STATUS" board is used to show incoming shift personnel which engines, pumps and other equipment is in use. Insert type explains in detail how board is used.**



● **PLANT is completely independent of outside power sources. Here are three dual-fuel engines driving 450-kw generators to power all motors and auxiliary equipment.**

from all sources to be 14.4 mgd in July; 21.4 mgd in August; 22.6 mgd in September; and 16.7 mgd in October. Domestic and non-seasonal industry was constant at 10.5 mgd; but cannery waste varied from 3.9 mgd in July to 10.9 in August, 12.1 in September and dropped to 6.2 in October.

Various refinements were observed within these average figures. The maximum day, occurring in August, was 24.7; the minimum, in June, was 6.5 mg. Peak rates ranged from a high of 33.7 mgd to a low of 3.5 mgd. Coupled with these figures, experience and engineering judgment led to adoption of percentage ranges for design purposes: Average minimum to be 40-50 percent of average daily flow, average maximum to be 130-150 percent; and average 8-hour daytime period to be 125-140 percent of average daily flow.

Further to substantiate these estimates, Hyde & Sullivan adopted criteria for expansion of San Jose's sewerage needs. Population increase of 45 percent in the 20 years 1950-1970 was a reasonable expectation. But what of cannery waste volume? Estimates by the industry were both liberal and conservative. However, Hyde & Sullivan observed that doubling the cannery waste load would increase the BOD from that source by only 10 percent. Accordingly, a 20 percent growth in cannery waste was assumed; and it was determined to develop an initial plant design for 50 percent population increase, with further provision for expansion up to the outfall hydraulic capacity of 65 mgd, or 187 percent of 1950 requirements.

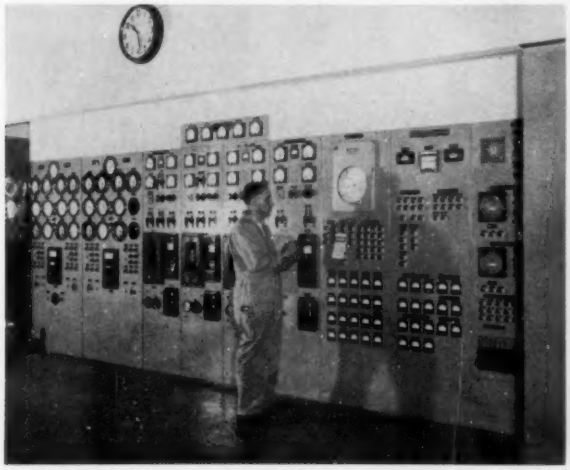
Size of Plant Units

The long flow (7 miles) in the outfall sewer meant septic sewage, a condition that might interfere with sedimentation. Aeration tests of sewage samples led to determination of required aeration time to freshen the sewage. Coupled with findings as to volume, this permitted establishment of the capacity of plant equipment.

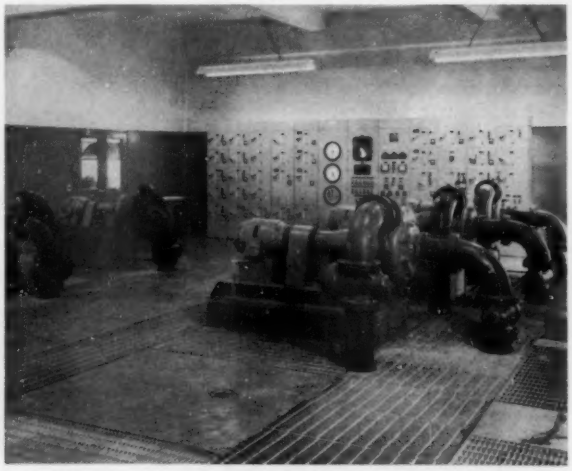
Power Generation

A common objective in modern treatment plant design has been well achieved at San Jose: The facility is completely independent of outside power source, except for a small requirement of pilot oil for dual-fuel operation of the three Enterprise DGSG-8 engines. The engines drive 450-kw Electric generators that supply power to all motors and auxiliary equipment, including a fresh water well on the plant property.

The principal novelty of the power arrangement is its use of vapor phase cooling to secure several advantages, all of them ultimately reflected in plant operating economy. Vapor phase cooling means a jacket water temperature of 235 or 240 degrees F, with heat transferred by flashing a portion of the water to stream. The temperature throughout the jacket water circuit remains



● **CONTROL board in the main plant. A panel is included for a possible fourth engine to be installed at later date.**



● **SLUDGE control room, showing pumps provided to move sludge to and from the digesters, in accordance with needs.**

● **PLUNGER type sludge pumps are used to handle the raw sludge from the settling tanks to the digesters.**

essentially at the boiling point or better.

With respect to the engine operation, this high temperature means three things. First, it prevents corrosive action of sulphur from the sludge gas used as principal fuel; also it contributes to better fuel efficiency. Engineers of Enterprise Engine & Machinery Co. estimate that the rate of fuel consumption is lowered from 0.395 to 0.36 lb. per bhp-hr. Finally, it means that the engines operate at nearly constant temperature regardless of load. Wear and tear is less for this reason, and there is no condensation of moisture in the lube oil system since temperatures never get below the "dew point" of about 140 degrees.

Steam generation—With respect to plant operation, vapor phase cooling provides steam at 10 psi for use in the digesters without the need for separate steam generating equipment. There are, of course, special accessories for vapor phase. First, the engines are equipped with exhaust heat recovery silencers by Engineering Controls, Inc. In conjunction with these is operated a steam separating unit from the same manufacturer, and two sidearm type 75-kw electric heaters.

Although the jacket water is above the boiling point in normal operation, additional heat is readily available in the engine exhaust gases. (It is estimated that 30 percent of heat energy input to the engine remains in the exhaust gases). The heat recovery silencers cool the exhaust to the maximum extent without condensing, and in the process boost the jacket water temperature even higher before it is flashed to steam in the separator. Sidearm heaters are standby units, for use when more digester steam is needed than can be supplied by engine heat alone.

There are additional points of economy in the utilization and disposal of exhausted gases and heat energy from the Enterprise engine operation. A small portion of exhaust gas is diverted and cooled, then compressed and dissolved in the sludge under pressure. It bubbles out of solution when the sludge flows to the concentration tank, stimulating formation of scum on the surface of sludge. Air can be used for this purpose but the carbon dioxide of the exhaust gas is more readily soluble and, hence, more efficient.

Besides supplying digester steam, the vapor phase cooling contributes steam used in space heating the building. In a less complicated heat exchange, engine lube oil is cooled without the need of a separate cooling water circuit. Instead, it is cooled in an exchange with primary sludge or raw sewage.

Engine Accessory Units

In addition to Enterprise dual-fuel engines, General Electric generators and the heat recovery equipment, the power generating system includes air starting equipment, lube oil and fuel oil equipment, gas compressors, feedwater treatment equipment, and provision for auxiliary power generation.

Air starting facilities include a pair of 3-hp. motor-driven Quincy compressors and two 30 x 84-in. air tanks. Lube oil is stored in two 400-gal. underground tanks and in a 250-gal. tank. A motor-driven Roper transfer pump and three motor-driven Roper prelube pumps are provided, along with one Honan Crane filter and heater, three Honan Crane bypass filters, and three Thermxhanger oil coolers with thermostatically controlled valves.

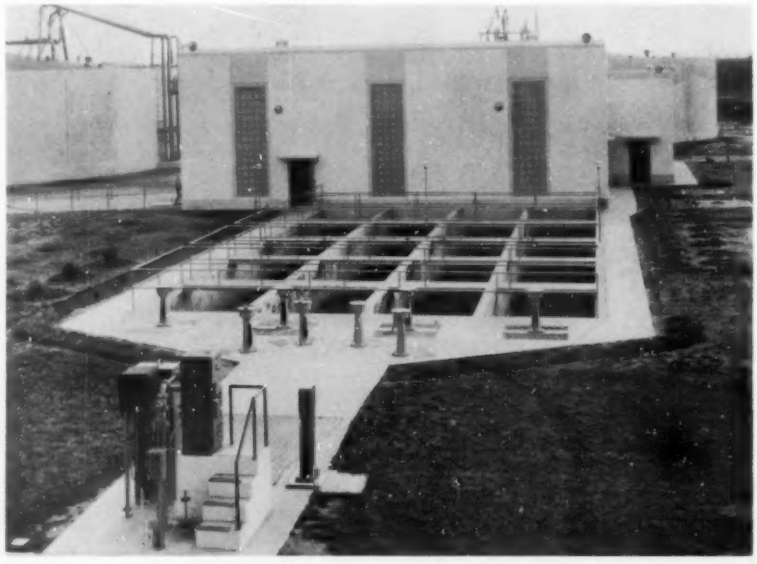
Fuel oil is held in one 8,000-gal. underground tank and two 350-gal. day tanks. A motor-driven Roper transfer pump is augmented by a hand-operated pump for emergency use. The system includes a duplex type Honan Crane fuel oil filter.

Two motor-driven Standardaire blowers serve to compress gas for engine operation. The feedwater system includes Proportioneers feeder pump, disc type meter with timer and reagent tank. For extreme emergency conditions, a Katolight gasoline-powered engine generator set provides up to 25 kw for lights, instruments and emergency apparatus.

Plant Operation

Operation of the engines themselves and channeling of the electric power they generate is virtually automatic, being concentrated at a control panel in the plant power building. Shift requirements of three men are established to cover routine maintenance and repair services, as well as standby personnel. In actuality, one man alone monitors and controls the entire plant function.

It is not contemplated that all the engines will be used at any one time, since they total nearly 1,900 hp against plant requirements of about 1,000 hp during peak flows. Generally only one engine is required, and the burden is shifted from one to another at intervals.



● **GRIT chambers, looking upstream from Power Building. Flow is then through a metering flume and into raw sewage sump. See page 88 for schematic flow diagram.**

Sludge concentration is undertaken when necessary—mostly during periods of high cannery activity—to increase the efficiency of digesters. If it were not for sludge concentration, which increases the solids content from 1 percent to 4.5 percent, the plant would have to include more digester capacity.

Flexibility of the plant is provided in the arrangement of valves and piping among aeration and sedimentation tanks. When sewage volumes are low over a period of time, and during winter months, extra tank capacity can be employed for modified activated sludge treatment. The design provides for use of as many as four tanks as activated sludge units.

Plant Flow

Flow of sewage, sludge and sludge gas is as follows: Sewage first passes through the overflow structure, where chlorine is added to prevent odors. Two Wallace & Tiernan chlorinators are provided, each with a rated capacity of 6,000 lb. per 24 hr. The flow is then channeled through one or more of four Jeffrey vertical bar screens where larger floating matter is collected and transported to grinders by a conveyor belt. Operating in a channel 5 ft. wide and 11 ft. deep, each rake rises at a rate of 10 ft. per min. The speed and bar spacing permit a rating of 18 cu. ft. per hr.

Flow then proceeds to the grit chambers which also are Jeffrey equipped. There are four of these each 9 ft. wide by 85 ft. long. The collection system in these chambers is rated at 15 cu. ft. per hr. Minimum velocity is 0.5 fps., maximum is 1.1 fps.

A large sump receives the raw sewage beneath the power plant. At this point are located four Fairbanks-Morse centrifugal pumps. Two are 24-in. pumps, rated 14,000 gpm at 495 rpm against a head of 16.5 ft. They are driven by 75-hp motors. The other two, driven by 50-hp motors, are also Fairbanks-Morse, rated 11,000 gpm at 495 rpm and a head of 15 ft.

These pumps convey the raw sewage into the pre-aeration tanks, each 34 x 70 ft. in plan and 15 ft. deep. Three Sutorbilt blowers are provided to supply air to the Walker Process diffuser system in these tanks. Each blower is rated 2,400 cfm at 7 psi. These are driven by 100-hp. Westinghouse motors. The sewage then passes through sluice gates into the sedimentation tanks. There are six of these, each 34 x 150 ft. and 10 ft. deep, with mechanical sludge collection equipment.

The liquid effluent is discharged into the outfall for disposal in Lower San Francisco Bay. The sludge is concentrated and delivered to one of three circular digesters, each 100 ft. in diameter and 33 ft. deep, equipped with Chicago Pump Co. floating covers. Three weeks of digestion are required, in the presence of steam, before this process is complete. Sludge gas is recovered constantly and stored in one low-pressure and two-high pressure tanks. Low pressure capacity is 5,000 cu. ft. High pressure capacity totals 12,000 cu. ft. at 80 psi, achieved by a 185-cfm. Gardner-Denver compressor.

Digested sludge is periodically removed to lagoons. There are four of these, with an estimated life of 8 years. Dried humus can be removed after about two years for sale and use as fertilizer. Sludge drying beds would provide a quicker drying time but would be more expensive in terms of both initial and operating costs.

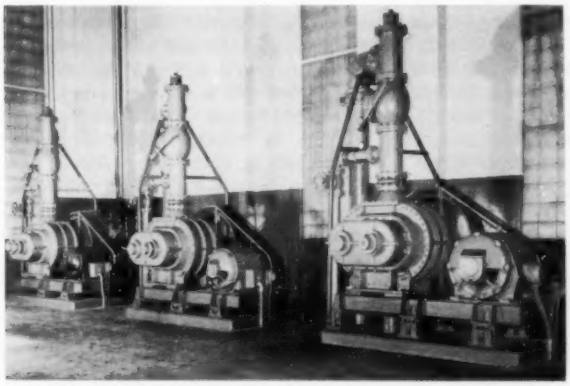
Other equipment suppliers included: sludge pumps, Ralph B. Carter Co.; sludge air lifts, Indianapolis Air Lift Co.; engine exhaust gas compressor, Allis-Chalmers; and control panels and motor control centers, Westinghouse.

Personnel

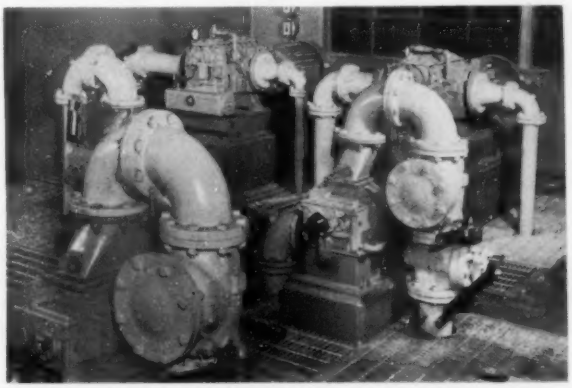
San Jose's sewage treatment plant represents the culmination of the efforts of more than the usual number of people. However, throughout the eight years that have seen active design and construction, Harold Flannery has been City Engineer for San Jose. The initial studies were conducted by Hyde & Sullivan of San Francisco, and this firm also designed the plant. David H. Caldwell was principal design engineer. Dames & Moore, soils engineers, provided the foundation analysis.

When land acquisition finally enabled construction, a new site was involved and some design modifications were required. Hyde & Sullivan having dissolved upon completion of the original design, San Jose called upon the firm of Brown & Caldwell. Again D. H. Caldwell led the design work, this time assisted by Herbert P. Nilmeier, who went on to be project engineer during construction.

Contractors on the plant construction were a joint venture composed of Walsh Construction Co. and E. V. Lane Corporation. Superintendent for the work was R. L. Mitchell. San Jose was represented throughout planning and construction by the author, who served as resident engineer and now retains the plant operation under his jurisdiction. Lester Dial is maintenance mechanic, and Earl Yokum is maintenance electrician. Ronald Doty is chief operator. Plant operators are Arthur Carte, Robert Hall, Charles Gerlach, and James Ramsauer.



● **THESE three blowers furnish air at 7 psi to aeration tanks. They are equipped with noise and vibration dampers.**



● **GAS control room. The pumps shown here move the gas from the digesters to low and high pressure tanks for use.**

Knowledge of GEOLOGY

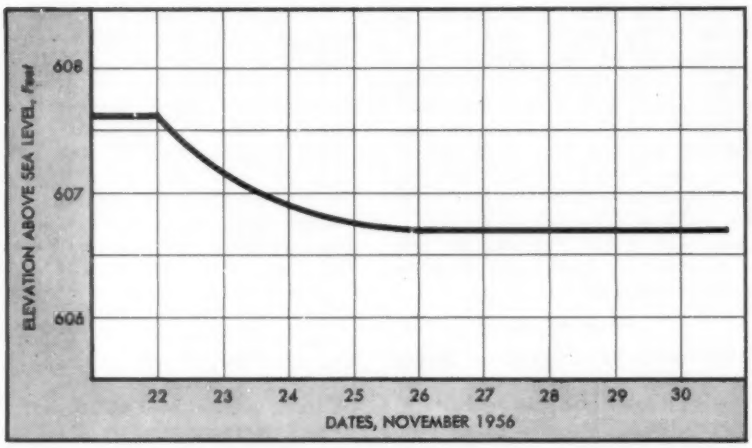
ROLAND K. BLUMBERG,
City Geologist,
and
GEORGE A. CUSHMAN,
City Engineer,
Seguin, Texas

HOW VALUABLE is a city's water supply? If the source of water supply suddenly begins to disappear, what can be done? These questions had to be answered by Seguin, Texas and some solution had to be found.

The City's only source of water was the Guadalupe River, which, in turn is fed by the Comal Springs in New Braunfels, Texas, approximately 18 river miles upstream from Seguin. The Comal Springs had never ceased to flow before the year 1956, producing an average of 300 cfs. The annual average river flow exceeded 400 cfs until 1950 when it began to decrease rapidly. On June 4, 1956, the Comal Springs were dry and the Guadalupe River flow had dropped to five cfs. Fortunately for Seguin, the Texas Hydro Corporation has three dams upstream from Seguin, impounding approximately 10,000 acre feet of water from which the City was able to obtain water during the low flow of the river. The Seguin dam forming the primary water source of the City, has a capacity of 800 acre-feet.

Seguin is situated near the contact of the Wilcox and the Midway formations. These formations dip to the southeast. The formation between the Midway and the Edwards (including Navarro, Taylor, Austin Chalk and others) are clays and hard limestones and contain no sands or porous limestones capable of producing water. The Edwards formation which would be encountered at a depth of approximately 2,000 ft. in the vicinity of Seguin is porous and waterbearing, but the water contains hydrogen sulfide and minerals, making it unsuitable for drinking purposes.

There are two directions one might travel from Seguin to obtain water. One the Carrizo formation which contains vast amounts of water, is southeast at a distance of about 15 miles. The other is in a northwest direction where the Edwards formation containing fresh water, comes near the surface of the ground. This direction is upstream along the Guadalupe River. It was felt in looking for water that it would be advantageous to transfer water down the Guadalupe River rather than build a long pipe line to bring this water to Seguin. It was decided then to try to find water in the Edwards formation. On the Guadalupe River above the town of Gruene, Texas, a cliff along the river showed a formation that appeared to be a collapsed cavern. It was felt that although this cavern had collapsed there would be a zone somewhere below the surface that would contain caverns which might be connected to the Edwards underground reservoir system. A test well dug at this location and two cavern zones were found, one at 170 ft. and the other at 190 ft. The hole was enlarged and 22-inch casing was set and cemented to a depth of 60 ft., and the remainder of the hole was enlarged to 18 inches and to a depth of 211 ft.



● **FIG. 1. Performance curve of well over 10-day period. See text below for data.**

Proving the Well

After the installation of the pump, the performance curves gave data as shown in Figure 1. These curves were made by shutting the well in for a few minutes and measuring the static level in the well; but other than this slight shut-in time, the wells were pumped continuously for a period of one month. The performance of this well would lead one to believe that the well has been drilled into a large cavern and this cavern is in turn fed by many small openings. At the end of the pumping period the well was shut-in and the static level rose in a manner inversely related to the draw down.

Property purchased by the City has 1280 ft. bordering the river bank so that a well field could be developed if required. The plan was to obtain a well of 4,000 gpm and pump the water into the river for its trip down to Seguin. Although evaporation on the lakes would occur, it was believed that the periodic rains would be sufficient to maintain an adequate water supply for the City without lowering the lake level to any great extent.

The well was dug approximately 130 ft. from the edge of the river bank of the Guadalupe River. Since the well is in a fault zone of the Edwards formation, the terrain is in the nature of a bluff along the river. This had its advantage because of the flood history of the river. The well site was 31 ft. above the river, the level of the highest known rise of the river. Therefore, the pump motor was raised an additional three feet to get above the last known high water mark. In testing the well it was determined that 6,000 gpm could be obtained with a 20-ft. draw down, approximately. Since the cost of pumping water was most important, it was determined that 4,000 gpm would be satisfactory for the purpose at the time. The static level of the water in the well was nearly the same as the level of the water in the river. It was then decided to take advantage of suction to reduce

and ENGINEERING Solves Water Problems

the total dynamic head of the pump and thus reduce the horsepower motor requirements.

The normal discharge of the pump would be 34 ft. above river level, and the lift, therefore, would be 34 ft. plus the expected draw down of the well. To overcome this lift of 34 ft. the discharge was designed to come out below motor level. To do this a ditch 18 ft. deep was dug from the casing of the well to the river. The discharge from the pump column was flanged at 16 ft. below the pump. To offset the remaining 18-ft. lift, the discharge line and the pump column were designed to hold a vacuum, by placing the end of the discharge line two feet below the level of the river. As soon as water filled the discharge line, a suction or siphon was created which offset the 18-ft. lift. The result of the design left the total dynamic head at approximately 12 ft. which included a draw down of 10 ft. plus two-foot friction loss.

The formation into which the well was dug was limestone. To ensure a sufficient supply of water and thus a minimum draw down, the well was acidized with 3,000 gallons of acid. This helped considerably as was shown during the first week of pumping. At the start the draw down was 16 ft. but this value rapidly decreased until after the sixth day the draw down became steady at 10 ft.

Pump Design

After the water well was dug, there was the difficult problem of determining the pump design to be used. One serious possibility had to be proved beyond any question of doubt—that being whether or not the water pumped from the well was being pumped directly from the river. At the time of the well completion, the river was not flowing, but there was a pool of water approximately 10 acres in surface area at the point of our pump discharge. Near our side of the bank the depth of the pool was 30 ft. deep. It was possible, however, to build a weir at the discharge point of the pool down stream. At the time of installing the weir, the water would have to rise six inches before it would flow over the weir and discharge down stream. A special test pump was installed in the well and a continuous pumping for 24 hours at 5,000 gpm gave us sufficient water to determine whether or not recirculation would occur. After 18 hours of pumping, the pool not only filled up but ran over the weir in a sufficient quantity to prove that no recirculation was taking place.

If recirculation had occurred, it would have been necessary to extend the discharge 1,000 ft. down stream from the well location to discharge the water away from the trapped water pool; furthermore, it would have meant that we were moving the water in the river from one location to another down stream and may not have tapped the Edwards formation properly. This was not the case as it was definitely proved that there is no connection between the river and the well.

The next problem was to select pump characteristics which would do the job that was required. The total dynamic head was to be only 12 ft., and therefore, a very slight change of water table would affect our pumping conditions. If the water table would rise, the Comal Springs would flow, delivering sufficient water that the pump would not be used; therefore, the main consideration was what would happen if the water table would fall, thus increasing the total dynamic head of the pump.

The pump selected was a Byron Jackson vertical propelled pump which has an increasing pump discharge with a decreasing head capacity and BHP curves. Thus at a TDH of 12 ft. the pump delivers 4,450 gpm, and if the water table drops so that the TDH becomes 19 ft., the pump will deliver 4,000 gpm. The BHP curve would change from 22 BHP to 29 BHP. The San Antonio Machine and Supply Company carried out the construction of the discharge line which was difficult since it had to connect to the pump column and hold a perfect vacuum in order to offset 18 ft. lift by a suction principle.

All of the problems were solved, and the pump was run over a 30-day period and the cost determined as well as the water delivered. The power bill was $159.70. The total water delivered was 174 million gallons, making the cost per 1,000 gallons less than one mill.

● **WELL site was 31 ft. above and 130 ft. from river. Pump motor was raised 3 ft. more to get above high waters.**

● **DITCH was dug from the well casing to the river and pump discharge taken off 16 ft. below the pump level.**

● **REFUSE can provide a low cost resource for reclaiming marginal lands for use.**

MUNICIPAL REFUSE--- A Low-Cost Resource

CARL D. SMITH

Assistant Health Officer,

Cedar Rapids, Iowa

TOO OFTEN a municipal sanitary landfill resembles Topsy: It grows and fills in marginal land over the years, with little or no practical planning. City officials are usually aware of the increased value of the land filled, but they often neglect to keep in mind a definite ultimate use for the land. Thus, often the maximum value of the recovered land is never realized.

In Cedar Rapids, we have made conscious efforts to engineer our landfill towards a definite final purpose. Viewing our municipal refuse as a low-cost resource that can and should be put to profitable use, we are using it to construct an addition to a park in an expanding residential section on the southwest side of town. Here in the Midwest where so much of the land is open cornfields, a tree-covered park where families can picnic and children can play away from street traffic seems the most suitable use for the land we have available.

A section of intended parkland, adjacent to a 140-acre undeveloped existing park, is being planned and constructed with the same detailed engineering that might go into a new road. The major difference is the construction materials used—garbage and rubbish and dirt instead of concrete or asphalt and dirt.

Plenty of Space

We have available, at this location, 94 acres, purchased by the city for $20,000. Of this, we will probably use 40 to 50 acres, under the current plan. We have been filling for about a year and we will have an estimated 5 to 8 years on the plot. The land is basically flat, but Prairie Creek flows diagonally through it forming a gully. In the spring flood waters from the Cedar River often back up into the creek, causing it to overflow and further erode the land. Timber and brush covered most of the area.

The first order of business on moving our landfill to this new location was to clear the trees and brush from the area to be filled. We sold much of the more valuable timber to loggers. Next, a U-shaped bend in Prairie Creek was cut out and the old channel filled with the first refuse brought to the site. About 100 ft. from the creek channel we have built a 14-ft. high berm, confining the creek overflow; in back of the berm we are filling. North-South across the sector we are building a 5 ft. high terrace and will fill to change the slope of the terrain so that it will drain towards the creek.

For bringing refuse to the fill, the city employs 11 Heil 16-cu. yd. Collectomatic trucks. Three of these make two trips a day and the rest one a day, collecting garbage and rubbish from the approximately 85,000 people. More units will be added as time goes on, for Cedar Rapids, at its present rate of growth, is expected to reach a population of 100,000 by 1960. The entire city uses the landfill for dumping, and as many as 100 to 150 loads a day are brought in by private, commercial and construction company haulers.

Landfill Operation

Everything—garbage and rubbish—is dumped in together and compacted by a Caterpillar D6 tractor. All cover material comes from the site itself. A Caterpillar D7 tractor with No. 60 scraper excavates 150 to 175 ft. ahead of the fill, but only what cover is needed is excavated. In spring, summer, and fall, the D7-No. 60 covers the fill daily with about two ft. of soil, while in the winter months it covers as necessity demands (determined by weather, presence of combustible materials, etc.) There have never been any rats or complaints of odors, papers or other nuisances. The landfill operates seven days a week; three days a week two operators are on the job; on four days there is one operator. Operating concurrently with the landfill operation is a salvage operation. The right to salvage is leased at $150 a month to a salvage operator.

The cost of running the landfill operation for 1955, excluding capital investment, but including salaries, tractor parts, etc., was $9,667.92, or about 11¢ per capita.

When the landfill is completed in this area, the land will revert to the City's Park Department at no cost. The Park Department will then have about 200 acres, including the existing park, to work with in preparing a fine civic park.

LOCATING GRAVEL SOURCES *For Highway Use*

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Highway Research and Extension Engineer

O. K. DART, JR.,
Instructor
Department of Agricultural Engineering, Cornell University

TO ROAD MEN WHO inhabit that rather small northern area of the country once visited by glaciers, gravel deposits are justly considered as valuable natural resources. Unfortunately, we are faced in many of these areas with a depleting supply of satisfactory materials.

As our supply diminishes, it seems that we're going to have to do some prospecting or detective work to "uncover" all of the possible sources of granular material in our area. Just as geiger counters are used in prospecting for uranium, there are some simple tools that we can use in becoming good gravel prospectors. Of course we can forget the prospecting techniques and scatter the countryside with 50-foot drill holes but this would be a pretty expensive endeavor.

Don't forget one important detail. If Mother Nature didn't leave any gravel in your area, even the best prospecting tools are not going to locate gravel. Yet, if there are any gravel deposits, we should consider it our responsibility to find them.

In this article we will consider several techniques for locating possible gravel sources; we will not be concerned with the quality of the materials. In a second article, we will consider how we should evaluate the suitability of these possible sources for highway use.

Where Did Gravel Deposits Come From?—A two-word answer to this question might be "up North." Perhaps 10,000 or more years ago, masses of ice, thousands of feet thick, crept slowly across Canada and northern areas of the United States. To use a couple of shop terms, a glacier behaved like a combination of a bulldozer and a rasp in reshaping the land. Today, with our warmer climate, the glaciers have melted or retreated far to the north but we have plenty of evidence of their handiwork. To consider all of the many landforms created by the glaciers is not within the scope of this article; from the viewpoint of gravel prospectors we will confine our discussion only to those glacial landforms in which the glacier "fillings" (boulders, cobbles, gravel, sand, silt and clay) were sorted by rapidly flowing water.

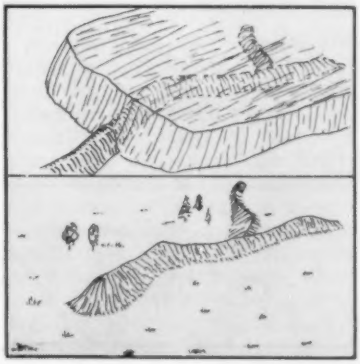
This and a subsequent article—"Evaluating Gravel Sources for Highway Use"—are adapted from the published notes for the Cornell Short Course—Location and Evaluation of Gravel Sources for Highway Use. This 5-hour course has, to date, been given to twelve groups of local rural highway superintendents in New York.

How Were Gravel Landforms Built?

As we discuss (and oversimplify) the complex process of glaciation, we should remember that a glacier was not pure ice; in its formation and during its travels, it had picked up and retained large quantities of rock, cobbles, soil, trees, etc. Our concern is how and in what form the glacial melt waters sorted out sand and gravel.

Six landforms likely to contain sand and gravel are eskers, kames, beach ridges, deltas, outwash, and terraces. Before we discuss how these landforms can be spotted, we should understand how they were built and what they look like.

Eskers—During extremely cold weather, very little melt water flowed from the glacier. But during periods of thawing temperatures, the ice at the surface melted and, like any water, flowed downhill. This flowing water tended to concentrate into streams at the top, within, and beneath the ice. The flowing water was not clear but muddy, carrying or dragging soil materials ranging in size from clay to cobbles. When temperatures dropped and the quantity of melt water decreased, the speed of the flowing water was reduced. As the speed of the flowing water was



● **ESKER was formed by a stream on top, in or beneath a melting glacier.**

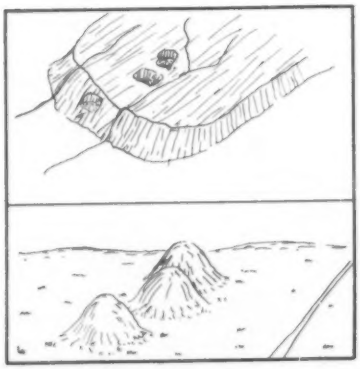
reduced but slightly, the larger cobbles were dropped and the smaller particles remained in suspension. As temperatures dropped further, the speed of the flowing water decreased more yet and gravel and sand particles began to settle out. As long as these streams continued to flow at all, however, the smaller silt and clay particles remained in suspension and flowed on as muddy water. (In order for silt and clay particles to settle out, the water must be nearly still, as in a pond or lake).

So, in a period of time, melt waters flowing on top of, within, or beneath the glacier dropped sand, gravel and cobbles in stream beds. As this process continued, deep beds of stratified or layered materials were built up. These layers or stratifications in many of our gravel deposits are the result of variations in the speed of the flowing water.

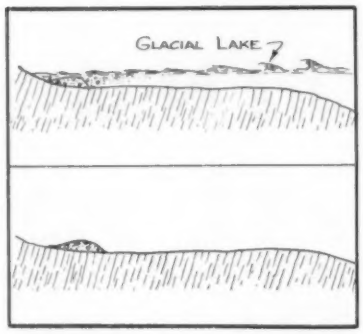
As the front of the glacier moved backward, the gravelly stream bed was left as a remnant—a long, stream-like ridge of sand and gravel which the geologists call an esker. Eskers range from a few hundred feet to several miles in length. The height of the eskers is variable but 20-40 feet may be average.

Kames—The top and front surfaces of the glacier were not smooth; there were often large depressions or plunge basins in the ice. As melt water flowed into or over one of these depressions, its speed was reduced and the coarser sand, gravel and cobbles settled out. Over a period of time, these depressions became filled with granular materials and when the glacier melted, these materials were left as gravel hills. These rounded hills, containing sand and gravel, are called kames.

Beach ridges—We have all noticed that the beaches of most present-day lakes are covered with sand and gravel. Wave action deposits these granular materials along the shoreline. Thousands of years ago, portions of your state or county may have been covered by lakes of glacial melt water. These glacial lakes, in many cases, were enlargements of present-day lakes. Although large areas of these old lakes may be dry today, we find beach ridges marking the receding shorelines.

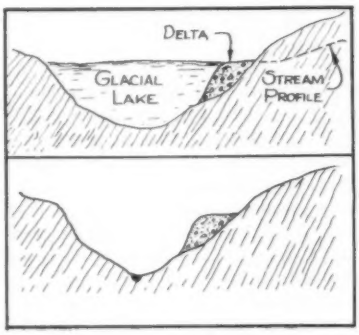


● **KAMES. These formations resulted from the accumulation of granular material in depressions in glacial ice.**



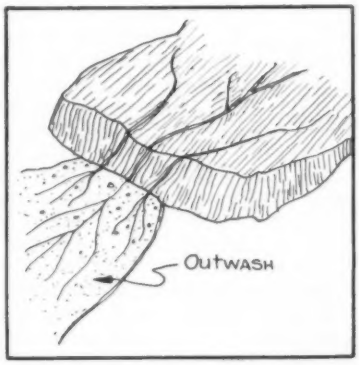
● **BEACH RIDGE formations occurred through wave action at the shore line of lakes fed by glacial melt waters.**

Deltas—Granular deltas are deposits of sand and gravel formed when a rapidly flowing stream, carrying or dragging coarse materials, suddenly enters a body of still water. The speed of the flowing water is immediately reduced and the coarse materials are dropped. We see many deltas being built today where rapidly flowing streams enter a body of relatively still water. In discussing the formation of beach ridges, we pointed out that in glacial times, many areas of the northern United States were covered with lakes of glacial melt water. Some of these were relatively small lakes, trapped in valleys by the glacier. Deltas formed at the edge of these lakes; today, the melt water is gone and these old deltas are left high and dry. Deltas are slightly sloping to steep deposits—usually, but not always, found adjacent to present-day streams. The underlying topography is usually sloping.



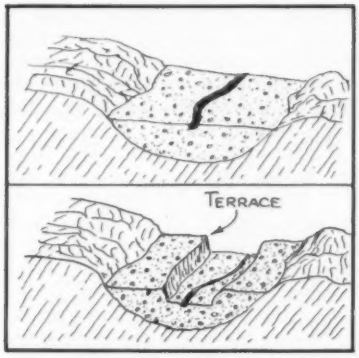
● **DELTAS appear where a stream entered the still water of lakes and deposited coarse granular material.**

Outwash—Remember that the glacier was not clear ice but contained much debris, including gravel and sand. As the glacier melted, large volumes of melt water flowed from the glacier, carrying and dragging the debris along with it. As this rushing melt water emerged from the face of the glacier, its speed was reduced and the coarser sand and gravel particles were deposited. The silt and clay particles remained in suspension and flowed away with the melt water, leaving relatively clean deposits of sand and gravel. As this process continued, "overloaded" streams of glacial melt water contributed more and more to the deposit of sand and gravel. Geologists define such granular deposits as outwash. As might be expected, outwash deposits are usually quite flat and cover a relatively large area in contrast to eskers, kames, beach ridges or deltas. There are usually remnants of old streams which contributed to the deposit.



● **OUTWASH from melting glacier dropped coarser sand and gravel when rushing melt water reached flat area.**

Terraces—Terraces are similar to outwash except that they were formed between valley walls and, subsequently, have been modified by stream action. Sands and gravels were deposited between valley walls and at some later time more water poured down the valley and cut a trench in the surface of the granular outwash. Subsequent erosive flows of water cut the trench deeper and several steps or terraces were left in the original outwash. These flat terraces, containing sand and gravel are found high and dry near



● **TERRACE. Top sketch shows deposit of gravel; lower sketch shows result of subsequent stream action.**

many of our larger present-day streams.

Locating Gravel Deposits

So far, we've discussed how gravel deposits have been formed by Nature. Now, how are we going to locate all of the deposits that Mother Nature decided to leave in our particular area? Some deposits may be of poor quality and unsuitable for highway use but it's to our interest to locate all of the possible deposits so that later we can evaluate their suitability for road use.

How should we go about it? How can we spot these eskers, kames, deltas, etc? There are four general rules we should follow in locating possible gravel deposits. These rules, and a discussion of their use and limitations are summarized here.

Keep Your Eyes and Ears Open—As we understand how gravel landforms were built, we should be on our toes to see if we can recognize them as we travel around. Watch for the characteristic shapes but realize that a ground view is always limited in scope and we can quite easily be fooled.

Even if we can't bat 1,000, it pays to be alert. Suppose you were ridden "lay of the land" similar to the one pictured at the bottom of this page.

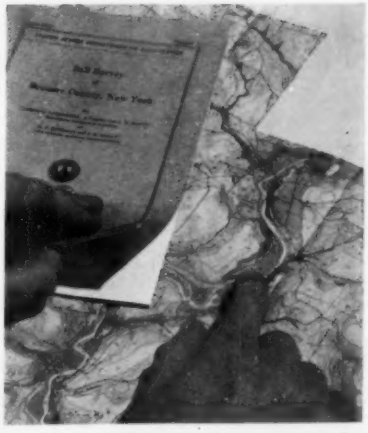
What is the landform? You might well surmise that these rounded hills are kames. With experience, certain criteria will run through your mind and will help to check your hunch. Is it a rounded conical hill or knob, either isolated or in groups? Does it have fairly steep side slopes? Is the average height about 50 feet? Are there no streams and few, if any, gullies on the knob? Does it have sparse vegetation, especially near the top? Is the ground often wetter at the base of the knob?

While practicing the recognition of gravel landforms, some other practical pointers may be of value. If you notice a cultivated field containing many rocks or stones, note the area as a possibility if the stones are rounded. If the stones are well-rounded or waterworn, it is likely that the deposit has been placed and assorted by running water. Water assortment is unlikely if the stones are predominantly flat.

● **CULTIVATED field in an outwash.**

Some road men are too enthused when they find a woodchuck hole bordered by a pile of gravelly material. This enthusiasm should be tempered by the realization that much of the finer soil that may have been brought out of the hole has been washed away by rain. We should be more concerned with the shape of the gravel particles than with the apparent absence of fine soil; again, rounded gravel is the best indicator of water assortment.

● **WHAT landform is this rounded hill? Did you say "Kame"? You're right.**



● **AN agricultural soil survey can be of help in your search for gravel.**

It pays to listen as well as look. If a landowner tells you about some gravel on his property, find out how much he knows about it and then indicate this information on your map as a possibility to be investigated.

Check Agricultural Soil Maps

In the limited time we have available for gravel prospecting, we have but a brief opportunity to talk to landowners about possible gravel deposits on their properties. In fact, many landowners haven't given much thought to the location of gravel deposits. We are limited as to time available for walking over a township or county in an attempt to spot gravel deposits. Even if we had the time, it is often difficult to spot a possible gravel deposit when we're standing right on top of it. If the observations and experience of others are available to us in publishing maps and reports, we had better look them over very carefully.

For many counties in the United States, an agricultural Soil Survey (map and bulletin) is available. Bulletin No. 22 of the Highway Research Board lists the status of county soil mapping in the United States as of 1948 and we understand that another HRB bulletin, soon to be published, will bring this information up to date. Such reports list the libraries in your state where complete sets of Soil Surveys are available but you should have a map and bulletin for your county on hand in the highway department. The older Soil Surveys for some counties are out of print and you

a)

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Palmyra gr	
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b)

For discussion, the soils are grouped, according to
units they occupy, as follows: (1) Soils of the drum
like hills; (2) soils of the gravel hills; (3) soils of the
(4) soils of the Appalachian Plateaus, Southern N
(5) soils of the glacial outwash plains; (6) soils
(7) soils of the glacial lake plain; (8) soils
marshes; and (9) miscellaneous land types.
cessive or poor, has much to do with determ
on the soils. It is, in turn, determined l

c)

SOILS OF THE GRAVEL HILLS

Soils of the gravel hills are represented by only one type—Groton gravelly loam.

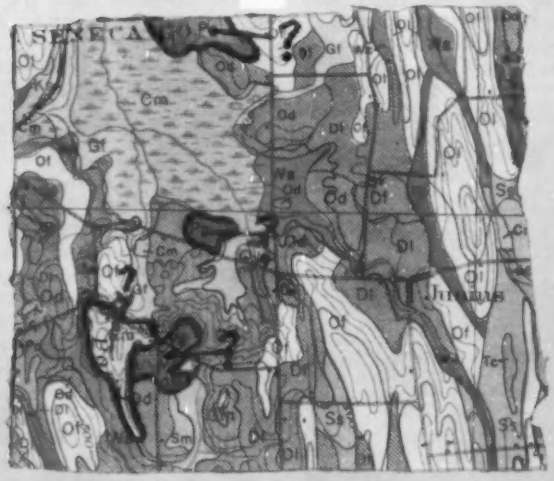
Groton gravelly loam.—
ad-kame relief

SOILS OF THE GLACIAL OUTWASH PLAINS

Members of the Palmyra and Chenango series are developed from gravelly deposits on glacial outwash plains. Bo
oughly drained through the gravelly subst
are agriculturally superior to the

d)

e)



may have to be satisfied with a loaned copy, but first—check with the county agent, the Soil Conservation office, or the State Agricultural College to see if a spare copy is available.

If you want to read the Soil Survey report from cover to cover before looking at the map, it won't be time wasted. There is a simple technique, though, that can save time and minimize confusion. Keep in mind that, for the present, you're using this report to spot gravel landforms and not to get detailed information on all of the soils in the county. Your mission is to locate the eskers, kames, outwashes, etc.

The layout of Soil Survey reports will vary, even among counties in the same state; yet, it is worthwhile to describe generally the steps in skimming a typical Soil Survey bulletin. The steps are as follows:

(a) Look in the table of contents of the report and find the chapter titled *Soils* or *Soils* and *Crops*.

(b) Skim the early part of this chapter for the paragraph or section listing the landforms (or soil groupings which mention any of the gravel landforms we have discussed). Look for eskers, kames, beach ridges, deltas, outwashes or terraces. Sometimes eskers, kames, beach ridges and deltas are grouped in the term gravel hill. If none of these is listed, the Soil Survey won't be of much help in your area. If they are listed (and the report is yours), better underline them.

(c) Continue to skim this same chapter until you find the names of the soils that are mapped on each of the gravel landforms. In this example, the gravel hills are mapped as the Groton series; the outwash is mapped as either Chenango or Palmyra. Underline these in your report and keep them in mind. Don't worry too much that these are called "gravelly loams." The agricultural soil mappers were interested in the surface soils which, to us, represent only the overburden. We're interested in what lies below. It is better to use the soil series (Groton, Chenango, etc.) as a guide than merely to look for gravelly loams. A gravelly loam surface soil does not necessarily indicate a water assorted deposit.

(d) Now, let's turn to the soil map and study the legend. Let's find the colors and symbols representing each of the soil series which is mapped on a gravel landform.

● **STEPS in scanning a typical soil survey for possible gravel deposits is described in text. See references above.**

(e) Now that we know the colors and symbols, scan the map in the area of interest. Draw an outline around each of these selected map units wherever you find them. It is suggested that you place a question mark beside each of these outlined areas because they must be considered only as possibilities until they are investigated in the field.

It is usually a good idea to read the section of the report giving a detailed description of the soils mapped on gravel landforms (Groton gravelly loam, etc.). The information concerning depth of overburden may not be readable, especially in the hilly type of gravel landform. The writeup can give you a general idea, though, as to whether the gravel is likely to consist of limestone, sandstone, shales, etc.

You may ask the question, "If I don't find any of these gravel landform map units in my area, does this mean there isn't any gravel?" Not necessarily. It means that your chances are less than if you had found these map units. Many gravel landforms are too small to be of agricultural significance and perhaps too small to be shown at the scale of the map. A gravel deposit, one acre in area, might not be shown on the agricultural soil map but may be of considerable interest to us.

Geologic information usually is not as readily nor as widely available as agricultural soil information but, where available, may be very helpful in gravel prospecting. If you write your state geologist, ask specifically for information on the glacial geology of your area. Mapping which pertains to bedrock geology will be of little use in prospecting for deposits of sand and gravel.

In most cases, maps or reports on the glacial geology of an area were not prepared for the road man; we may have to hunt to find specific information on the location of gravel landforms. In other areas, geologic information may be just what the doctor ordered. Work completed (but not yet published) by the N. Y. State Geological Survey is an example of mapping "made to order" for gravel prospecting.

● **SAMPLE of mapping in progress by the New York State Geological Survey. Note the beach ridges southeast of Watertown.**

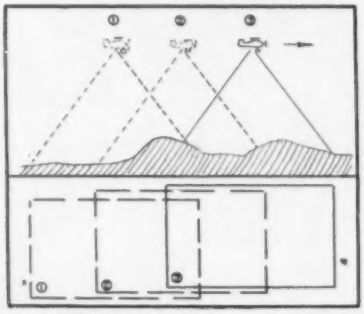
Rely On Aerial Photographs

Asking landowners about possible gravel deposits has obvious limitations. In walking over the ground, we are limited by a restricted field of view which often hides the overall shape of a landform. While ground prospecting, we often wish we could get up in the air for a "birds-eye" view. Smaller landforms, of great significance to us, may have been insignificant from an agricultural standpoint or too small to be shown on the agricultural map.

The only complete inventory of Nature's handiwork is the aerial photograph. The only limitation in spotting landforms on aerial photographs is our ability to recognize them. Every landform is shown. Our task is to become sufficiently familiar with the gravel landforms that we can readily recognize them. If we know how they were formed and generally what they look like on the ground, there's no reason why we can't rapidly scan the photographs for these familiar landforms. A trip that would take hours on the ground can be made in a few minutes on the photograph. And we gain the all important perspective from our birds-eye view. Of course, we could charter an airplane for a trip to spot landforms. Such a trip would be quite expensive and after returning, we would have no permanent record for re-study. The aerial photograph is an inexpensive record of one airplane trip that we can use over and over again.

Availability and cost of aerial photographs—You may not realize that existing aerial photographs are available for almost the entire United States. The newer photographs will be better for most highway department purposes than those flown in the late 1930's, although gravel landforms appear the same now as they did many years ago (unless the gravel has been removed). For gravel prospecting, the time of year that the photographs were taken is more important than the particular year. For gravel prospecting, it is desirable that: (1) the ground was free of snow; and (2) there was little or no foliage on the trees. It is quite obvious that photographs taken in the early spring or late fall are most suitable.

To learn what agency holds the negatives of your area, write the Map Information Office, U. S. Geological Survey, Washington 25, D. C. When writing a particular agency to order photographs, be sure to define carefully the area you are interested in. It may be de-



● **METHOD of taking vertical aerial photographs, showing how they overlap.**

sirable to outline your area of interest on a county road map and enclose this map with your letter of inquiry or purchase order.

We could advise you in one short sentence, by all means, to order the necessary index sheets and to be sure that you obtain stereo coverage. So that this advice is meaningful and does not seem extravagant, it seems advisable to expand our discussion to include a general idea of how aerial photographs are taken. If we understand how they were taken, we will understand better how they should be ordered and how they are used.

In a particular county, the plane starts down one edge of the county, traveling either east-west or north-south. The first photograph is taken at the edge of the county. The plane continues flying in a straight line and the second photograph is taken and overlaps the first by at least 60 percent. The plane continues on down the line (flight strip) until the first strip of overlapping photographs is completed. As soon as this first strip is completed, the plane moves over and starts down the second strip, insuring that this strip overlaps the first by at least 20 percent. This process is continued until the area is completely covered by overlapping aerial photographs.

It can be seen that the aerial photography covering an area of interest will consist of a number of individual overlapping prints. How do we find the prints we need to cover a particular point in question? This is where an index sheet is needed.

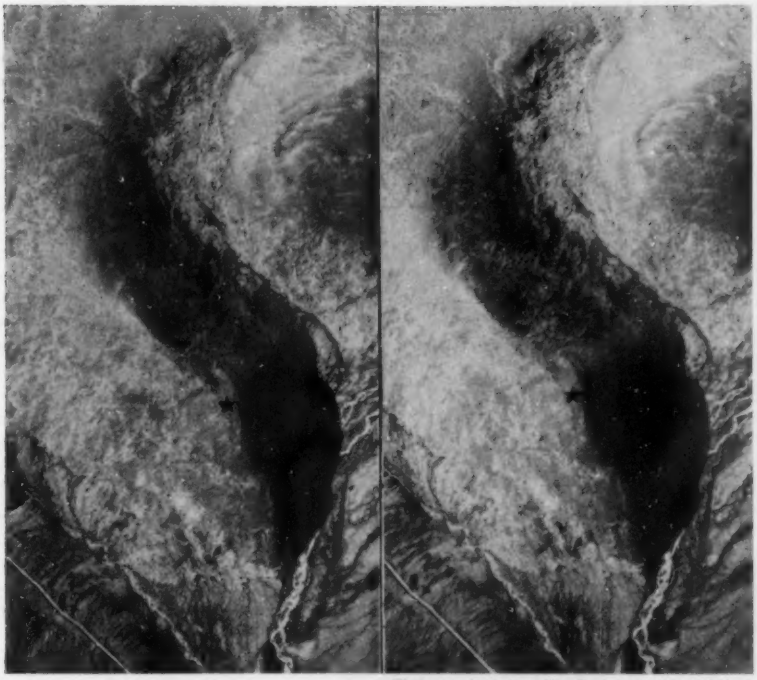
Index sheets are small scale composite photographs about 20-in x 24-in. in size, from which you can select the identification numbers of the individual larger scale photographs to cover a particular area. Index sheets were made by laying out the overlapping aerial photographs (contact prints) on a larger table—in their proper position. Each contact print has an identification number, usually in the upper right corner. A picture was taken of this layout of contact prints and the end result is called an index sheet. Index sheets usually are at a scale of one or two inches to the mile and cost about $1.10 each from government agencies. Usually, one index sheet covers either 20 x 24 miles or 10 x 12 miles, depending on the scale. The principal value of the index sheet is that it provides an inexpensive key or index to the larger scale contact prints. For example, if we're interested in the area near the Jones' farm, we find the Jones' farm on the index sheet and select the identification numbers of the contact prints that cover this area. Then we get out these particular contact prints and we're ready for business.

Contact prints are the same size as the original negatives taken in flight. The size of contact prints is usually 7 x 9 inches or 9 x 9 inches, depending on the type of camera used. The scale of the contact prints is often 1 inch = 1667 feet. (i.e. 1-inch on the contact print equals 1667 feet on the ground.) As an example of prices, contact prints from the U. S. Department of Agriculture cost 65 cents each in quantities of 1 to 100, 50 cents in quantities over 100, and 45 cents each if coverage of an entire county is purchased. Enlargements of contact prints are available at a higher cost but, for gravel prospecting, contact prints are preferred to enlargements because they are easier to handle.

In purchasing contact prints for your area, you have a choice to make. You can buy the so-called "alternate coverage" (every other print in a flight strip) or "stereo coverage" (every print in a flight strip.) By all means, purchase the stereo coverage. The stereo coverage will cost about twice as much as alternate coverage but its value to you is multiplied many times.

● **PORTION of an index sheet, USDA air photo, left. Jones' Farm is outlined. Index sheet is key to large photo.**

● **CONTACT print of USDA photo below shows the Jones Farm in more detail. Text above tells how to use the photos.**



Photos courtesy Canadian Dept. of National Defense

● **AN EXPERIMENT in stereo vision. Text below explains how to view this pair.**

We will be discussing this further but, briefly, stereo coverage permits you to study any area in three dimensions (depth)—easily seeing hills, valleys, slopes, etc.

Every rural highway department should consider seriously the purchase of aerial photograph coverage. The cost is surprisingly low and a highway department will find many uses for them other than gravel prospecting. However, if you find it impossible to purchase your own set of photographs, you can usually look at them in your local Soil Conservation office. It is likely that the prints cannot be taken from the office.

Setting up Aerial Photographs for Study—In setting up aerial photographs, we merely are orienting them so that we can study an area in three dimensions with a stereoscope. Our objective is emphasized in the stereo pair shown herewith. The term "stereo pair" refers to two overlapping photographs from a flight strip, properly oriented for viewing with a stereoscope. To get a better idea of the real value of stereo vision, try this experiment with the stereo pair shown above.

1. Assuming that you do not yet have a stereoscope, place a card or stiff paper about 6 inches high along the line between the photographs.

2. Place your nose directly on the edge of the card, so that your left eye sees the photograph on the left side of the card and your right eye is focused only on the right side.

3. Relax. Focus your eyes on the ★. Don't look at the picture, look through it.

4. All of a sudden you will see what stereo vision means. Hills will look like hills and valleys will look like valleys.

To get a real appreciation of the value of stereo vision, close one eye. Notice that the terrain looks much flatter. You will soon, if not now, agree that stereo inspection of the photograph multiplies the details you are able to see. (Note: The chances are good that you will be able to see stereo. However, some persons are not capable of stereo vision even after considerable practice.)

Your own contact prints must be properly aligned for stereo inspection. It is highly desirable that you purchase or borrow a pocket stereoscope. A stereoscope helps us to "click" our eyes into stereo vision and also magnifies what we see on the photographs. A pocket stereoscope costs from $6 to $12 and can be purchased from a number of companies including: Meyer Opticraft, Inc., 39 West 60th St., New York 23, N. Y.; Abrams Instrument Corp., 606 Shiawassee St., Lansing, Michigan; Fairchild Camera and Instrument Corp., Robbins Lane, Syosset, L. I., N. Y.; and Forestry Supplies, Inc., 132 Raymond Rd., Battlefield Station, Jackson 4, Mississippi.

Stereoscopic inspection of aerial photographs requires that we have in front of us two photographs, not just any photographs but adjacent overlapping photographs in a flight strip. To look at a barn, stereoscopically, that barn must appear in the two photographs placed under the stereoscope. Our job in setting up the photographs is to orient them so that one eye looks at the barn in one picture and our other eye is looking at the barn in the second picture. The best way to learn how to orient two photographs for stereoscopic study is to seek personal instruction from some one who has some experience; probably the Soil Conservation Service man in your area can help you.

If you're of a "do it myself" nature, the following instructions should guide you in your first attempt at setting up photographs for stereoscopic study. The procedure may seem complicated but after you've gone through the individual steps a couple of times you can forget the steps and orient the photographs "by feel". Here are the steps:

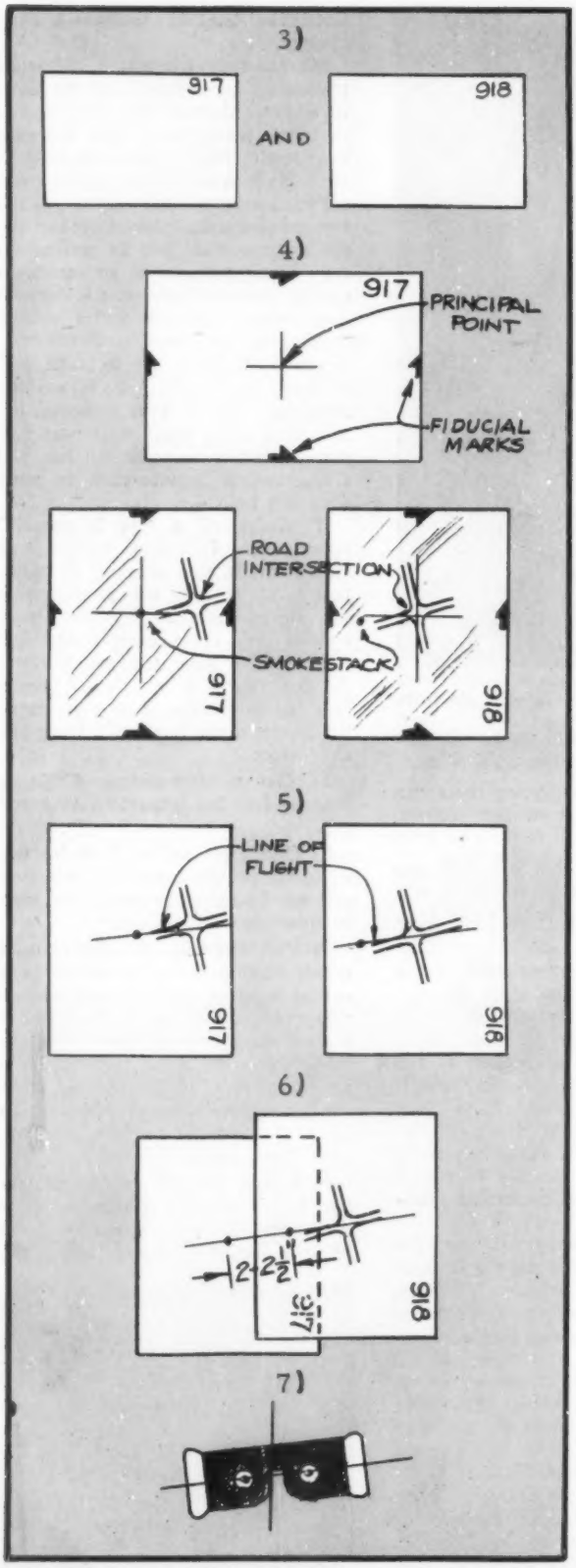
1) Get a stereoscope. (This is obvious but too important to leave out.)

2) Check the index sheet for the numbers of the contact prints you will need to cover a particular area in question.

3) Pull out two of these contact prints having consecutive numbers —that is, they are adjacent photographs in a flight strip. Notice that both of these photographs cover, in part, the same area of land. We would expect this, knowing that the photographs were planned to have at least 60 percent overlap. [See illustration overleaf.]

4) Locate the center (or principal point) of each photograph by connecting the fiducial marks. Let's assume, for the sake of discussion,

● **STUDYING contact prints with the assistance of a pocket stereoscope.**



● **STEPS IN ORIENTING** aerial photographs for stereo inspection. Center points of two consecutive photographs determine line of flight; this guides alinement of overlap.

that the center point of photo 917 falls on a road intersection. Note that both the smokestack and road intersection appear in each photograph. We might say that the area of land between the smokestack and the road intersection has been photographed twice—once when the plane was right over the smokestack and then when the plane was over the road intersection.

5) Draw a line connecting the smokestack and road intersection in each photograph. This line on the photo represents the line of flight of the airplane.

6) Lay photograph 918 over photographs 917 (or vice versa) so that the flight lines on each photograph connect. Slide the photographs closer together, keeping the flight line straight, until some particular point, say the smokestack, is visible in each of the photographs and the "two smokestacks" are 2 to 2½ inches apart.

7) Lay your stereoscope (with the centers of the two lenses about 2⅝ inches part) on the photograph, right over the flight line. Move the stereoscope along the flight line until the left lens is over the smokestack in 917 and the right lens is over the smokestack in 918.

8) Look through the stereoscope and you should see the smokestack and surrounding areas in three dimensions. In order to get the clearest image, adjust both the photographs and the stereoscope as necessary. The distance between the two lenses of the stereoscope should be equal to the distance between your eyes.

9) Once the smokestack stands out clearly in three dimensions, you can move your stereoscope up and down on the photograph and study all of the zone of overlap in three dimensions. Always keep the stereoscope oriented parallel to the flight line and be careful not to move the photographs. (Note: It may be worthwhile to anticipate two likely questions at this point:

b) Should I take my glasses off when using a stereoscope?
Preferences vary but usually it's best to leave your glasses on.

b) Can I look at anything beside the smokestack?
We used the smokestack, or one of the principal points, only for convenience in the explanation. Any point may be used to orient the photographs and any point that is visible in both photographs may be studied with the stereoscope.)

Recognition of Gravel Landforms—If we can recognize gravel landforms on the ground by studying their shape, recognizing them from the air is easier yet. In the aerial photograph, we see the entire landform with an unlimited field of view.

Just as our friends have certain characteristics or peculiarities by which we recognize them in a crowd of people, our gravel landforms (eskers, kames, etc.) have certain characteristics or peculiarities by which we are able to recognize them whether in Washington or in Chicago. Gravel landforms are like friends. An esker in Tompkins County, New York, will look pretty much like an esker in Ionia County, Michigan.

The only way to spot gravel landforms is to know what they look like. We can develop our technique only through experience but it should help to look at a stereo pair of each of the landforms and study the identification characteristics. If you have a stereoscope use it. If not, use the card as explained in connection with the stereo pair on the preceding page.

All of the listed identification characteristics will not be evident in the specific examples; they are listed for general reference as you may study possible gravel landforms on your own aerial photographs.

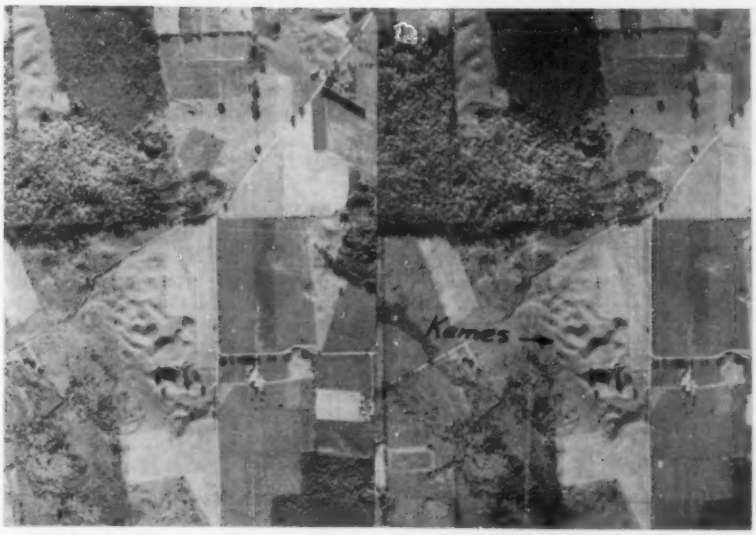
In Summary: Aerial photographs, studied with a stereoscope, can be extremely helpful in locating likely sources of gravel. The photographs are inexpensive and,

● **ESKER** characteristics are shown by snakelike ridge; steep slopes; no surface drainage (streams) on esker; varying height of ridge; generally lighter tone (shade of gray) on ridge than at base; and sparse vegetation on ridge except for the tree cover.

with practice, we can make a rapid and complete search for gravel landforms. Studying the lists of identification characteristics will be helpful but, generally, we can ask ourselves these five questions about any landform in question:

1) What's the shape of the landform? (If we know the process by which each of the gravel landforms was built, we know something about its shape or topography.)

2) What does the stream or drainage pattern look like? (Remember that sands and gravels are porous; there is likely to be more "soak-

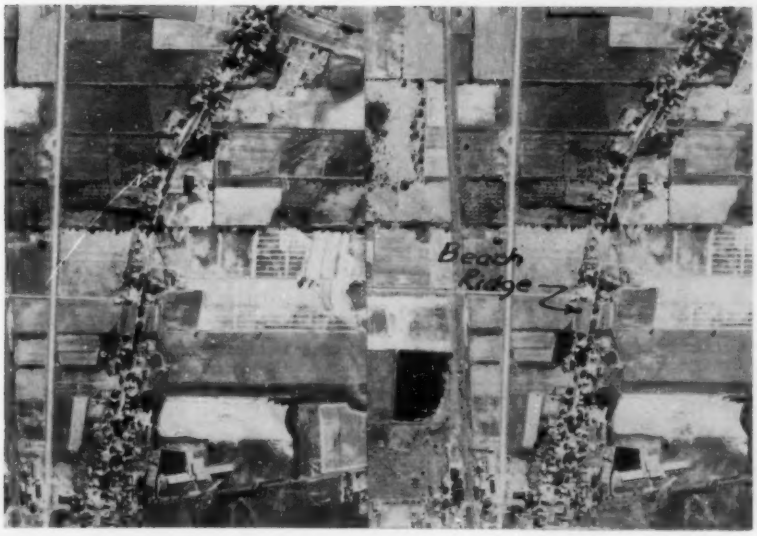


● **KAMES**, pictured in this stereo pair, have the following characteristics that are visible in an aerial photograph: Hummocky hills, isolated or in groups; steep sides; no surface drainage (streams); sparse vegetation on hill; and generally light tone.

in" than "run-off" and streams will be scarce.)

3) If there are any gullies, what do they look like? (We will find few gullies on granular landforms because of the excellent internal drainage. If we do find them, they are usually short, steep, and V-shaped.)

4) Is there much vegetation? (The hilly gravel deposits usually do not support a heavy growth of vegetation. The crests of these hilly deposits are especially dry. In the flat deposits, the presence of a high ground water table may contribute to heavier vegetative growth.)



● **BEACH RIDGE** appears in this stereo pair of aerial photographs. This shows characteristic low ridge; one side slopes fairly steeply while the other slope is more gradual; definite break in slope at the base of the ridge; no surface drainage or streams on the ridge; lighter tones on ridge than on adjacent land; and location that often parallels shoreline of a present-day lake.

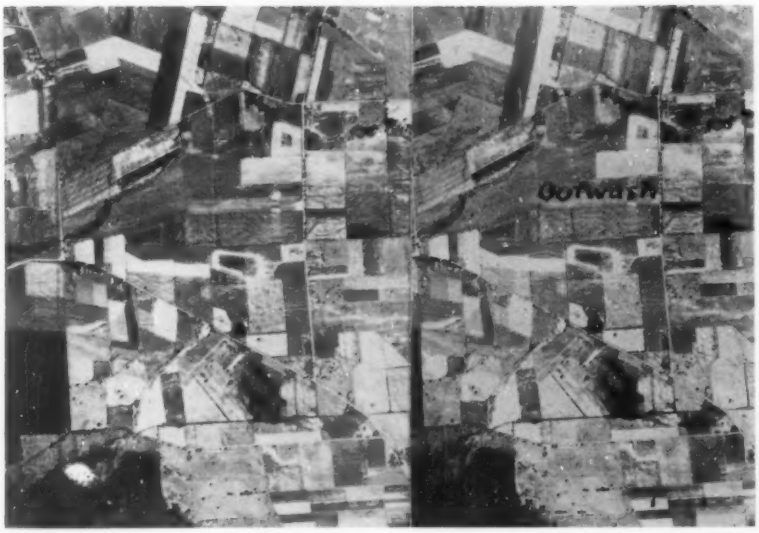
● **DELTA appears as a tongue-like deposit on a hillside. The top is usually fairly flat; also the tongue is usually cut by a deep gully carrying a present day stream (gully has V-shape with steep sides); the delta has a steep face on front facing the valley; and there is little or no surface drainage on the delta.**

5) Is the tone on the photograph relatively light or dark? (The heavier clay or silty clay soils retain more moisture than the free draining gravelly soils. Relatively dry soil is lighter in color than a wet soil and appears lighter on the aerial photograph. Also, the dry soils usually support a less dense vegetative growth which is reflected in lighter tones on the photograph.)

Don't Forget the Word "POSSIBLE"

Any of the gravel landforms which you have located are likely to contain water assorted granular materials. But, whether or not the material is suitable for highway use is an unknown factor. It doesn't pay to get too enthusiastic until you have had an opportunity to "dig in" and evaluate the possible source. Use your agricultural soil maps, study the aerial photographs, etc.—but by all means, *don't sell your shovel!*

[Note: A companion article, "Evaluating Gravel Sources for Highway Use", will be published in the September issue of PUBLIC WORKS.]



● **OUTWASH covers a wide expanse of relatively flat land; it is the only level gravel landform that contains small ponds or lakes; there is little surface drainage (few tributaries to main stream); there are scars of old stream channels; light tones in fields; and a defintie break in slope at base of hills adjacent to the plain.**

● **TERRACES, shown in the stereo pair at left, has steep face separating terrace level from bottom level; there is little surface drainage on terrace; gullies, if any, are short and V-shaped at edge of terrace; the landform usually parallels a present-day stream; there are lighter tones on terrace surface. Subsequent erosion may have dissected original terrace and left "outliers".**

TIMBER DOME COVER PROTECTS WATER RESERVOIR

UNCOVERED DISTRIBUTION reservoirs are notorious for their ability to collect undesirable objects such as dead birds and mice, grasshoppers, waste paper and the many things that small (or even large) boys like to throw around. The reservoir at Beaverton, Ore., was no exception to the general rule and, after many complaints, it was decided to cover it. Because the reservoir is located in a good residential area, it was decided that the covering must be unobtrusive and low; and it had also to be durable and relatively inexpensive to construct.

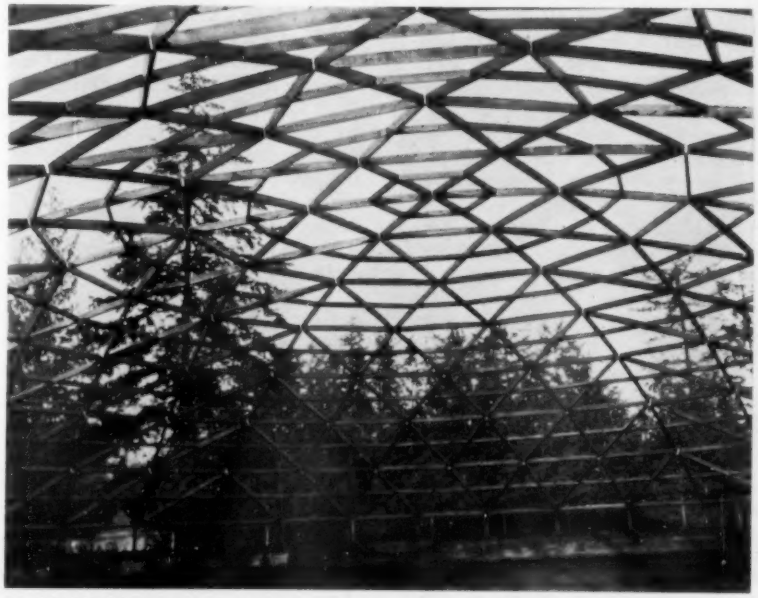
A timber cover was selected and the job of design was turned over to Timber Structures, Inc. The reservoir is circular, 75 ft. in diameter. The roof design called for a rise of only 13 ft., made up of six pie-shaped segments to form a pleasing dome. The general design of the supporting framework is shown in the illustrations herewith. The timber framework is composed of 2-inch by 6-inch structural grade Douglas Fir, with 2-inch by 4-inch headers running circumferentially at 30-inch intervals. All wood received a preservative treatment of 5 percent pentachloro-phenol-petroleum to provide a minimum net retention of six pounds per cubic foot.

Erection details of the dome were worked out by Lawrence Winkleman, Superintendent for Timber Structures. Construction started at the center and worked toward the outside. Gin poles were used in construction and to place the finished sections on the reservoir. Pipe colums, spaced equally around the perimeter were used to join the dome to the reservoir walls and a steel tension ring was provided to resist the horizontal thrust of the dome.

The timber framework was covered with one-inch tongue and groove cedar sheathing and a built-up roofing surface was applied. The dome area is 4,676 sq. ft. The cost of the supporting structure was $1.42 per sq. ft.; and for sheathing, roofing, ventilation louvres and painting 62 cents a sq. ft., making the total cost $2.04 per sq. ft. General contractor was Doerrie Construction Co. of Beaverton.

The dome, though spanning 75 ft. without a post, is remarkably light in weight, but solid and with unusual stiffness. The design is said to be specially suited for such projects since reactions are distributed around the periphery, thus eliminating concentrated loads and the need for special footings or for reinforcement of the structure.

● **PIPE columns are welded to universal joints at outer edge of structure. Steel strap acts as tension ring.**



● **UNDERSIDE view of reservoir roof framing shows interesting pattern of connected triangles, each divided by a heading member. Sheathing was placed later.**

● **TOTAL rise of completed dome was was only 13 ft. Reservoir diameter is 75 ft.**

25 to 30 Square Feet per Car

for DOWNTOWN PARKING

DOWNTOWN traffic congestion aggravated by cars parked along busy streets . . . too few parking spaces in the area where everyone must park who is to shop or transact business . . . rising land values in downtown sections which make conventional off-street parking facilities economically unfeasible . . . these problems are major headaches for officials in most American cities.

Two cities, one large and one small, are constructing multi-storied garages in the heart of their business sections. Boston is building a 13-story structure at Hayward Place and Washington Street that will have a total capacity of 697 automobiles. This will be the second largest off-street parking facility in the United States. Athens, Georgia, has a nine-story garage going up on Broad Street, a four-lane road which is also U. S. 29 and U. S. 78, and runs one block south of the city's main business street. Capacity will be over 250 cars.

The construction of these two municipal garages in the high land cost areas where they are needed has been made possible through the use of the Bowser automatic parking system. These garages require about 40 percent of the ground area needed for a ramp-type garage with the same parking facilities. Operating costs are said to be less than 70 percent of those of a ramp garage.

The principal feature of the Bowser system are automatic elevators which move automobiles vertically, horizontally and diagonally. The elevators require an average of less than 60 seconds to transport a car from street to stall and return again. The entire operation, from the time a motorist drives into the garage until he comes to take his car away, will be controlled by an electrical push-button system.

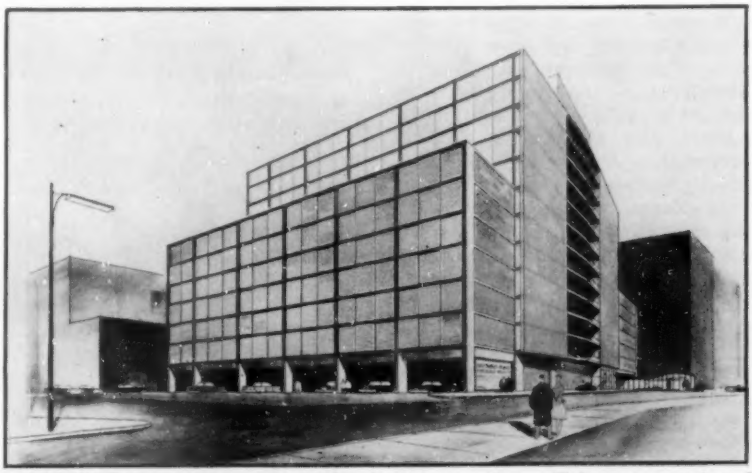
Boston and Athens officials took a long and careful look at existing installations before deciding to go ahead with their projects. Three Bowser municipal garages are in operation in Chicago, three are run by the City of Denver and one by the City of Des Moines. Careful inspection of the garages in operation showed the advantages of building an automatic garage. Boston, which expects to handle as many as 2,000 cars a day in the new garage, has already announced that the garage under construction will serve as a prototype for others to come.

Two-Way Travel

The combined horizontal, vertical and diagonal movement of the elevators in a Bowser garage brings an automobile right up to a designated stall, eliminating the problem of having to move several cars before one can be brought in or taken out. This is accomplished by using a standard 30-ton crane bridge which straddles the elevator well. The crane bridge is controlled by elevator-type equipment that provides the same automatic control and alinement horizontally that is found on the vertical travel of standard elevators. To accomplish the simultaneous lateral and vertical movement, the control circuits of the crane and elevator are interconnected so that one control push button selects the tier and floor level.

Several elevators, usually three or more, operate in the same hatchway. Automatic controls are restricted to the normal operating zone; however, for emergency operation each elevator can serve stalls in adjoining sections. Safety cutouts prevent the possibility of a collision between units.

The elevator cabs of the Bowser parking system are fabricated of aluminum. They are double-access cabs, equipped with power opera-



● **BOSTON'S new garage, right in the downtown section, will have a capacity of 697 cars. Building is designed for later conversion to business or mercantile use.**

ted, vertically opening gates front and rear. The elevator cab gates open or close in three seconds and are equipped with a retractable latch mechanism which lifts or lowers the safety gate at the hatchway end of a parking stall at the same time the cab gate is operated.

Elevators are counterweighted for their empty weight plus 40 percent of the rated capacity load. This is normal elevator practice because it greatly reduces the power consumption and improves the control adjustments as there is very little difference between an empty down load and a capacity up load. This feature is doubly important in a garage—if there should be a prolonged regional power failure. The elevators can be manually controlled and a garage can be unloaded without electric power. Operation would be slowed, of course, but at no time would cars be stranded or inaccessible.

Tickets Locate Cars

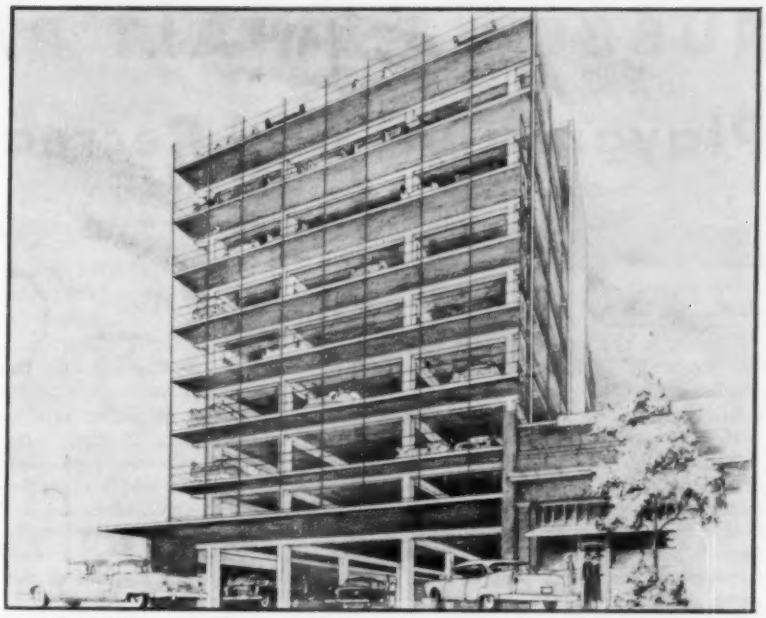
Three-stub tickets, pre-marked with stall numbers, facilitate checking and car-claim procedures. When the owner drives into the garage, he leaves his car in any one of the vacant receiving stalls. The checker in the garage stamps the "IN" time on the ticket, detaches the owner's claim stub and gives it to the owner. The checker then separates the two other stubs, placing one on the automobile, and sends the other via the pneumatic tube, to the cashier. The cashier places one stub in the corresponding stall pocket in the signal panel. When this stub is put into the pocket it lights a stall-occupied light on the receiving area (checker's) panel.

The elevator operator drives the automobile on the elevator, presses the button for the stall indicated on the elevator stub of the ticket and parks the car. He then places the elevator stub in a similar ticket pocket on the elevator. The operator then returns to the receiving area or picks up a parked car for delivery.

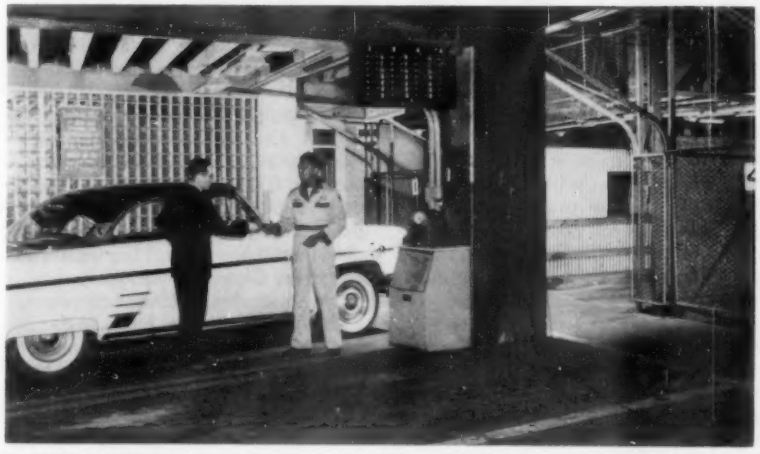
If any errors were made in placing the ticket stubs or parking in the wrong stall the signal lights will indicate the error when it was made, not when the owner is waiting for delivery.

When the owner calls for his car he gives the cashier the claim stub. The cashier then removes the corresponding stub from the panel which extinguishes the stall-occupied light for the checker's panel and lights the car-delivery light in the elevator. The operator pushes the stall button nearest to the light, removes the elevator ticket stub and delivers the car. The pickup and delivery operation starts before the owner's bill is computed, and his car is waiting when he leaves the cashier's office.

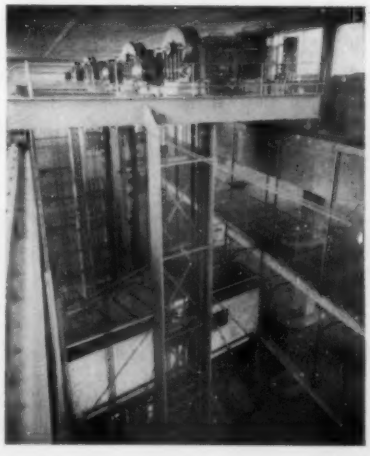
The owner's claim check remains with the cashier. It has "in and out time" and the amount collected stamped on it. These stubs provide an accurate record for garage bookkeeping.



● **ATHENS, Ga., nine-story garage on lot 70 ft. by 110 ft. will have a capacity of 250 cars. It is equipped with mechanical parking described in the text.**



● **CUSTOMER drives in and receives parking stub from garage attendant, starting procedures. Customer leaves his car in any one of the vacant receiving stalls.**



● **COMBINATION elevator and bridge lifts car to indicated parking stall. Several units, each serving a bank of stalls, operate in the same hatchway.**

RUBBER-ASPHALT PAVING FOR Playgrounds and Recreational Areas

H. V. CARLSON,
Xylos Rubber Company,
Division of Firestone Tire & Rubber Co.

THERE ARE two basic differences in the uses which rubber can serve in asphaltic pavements. These differences are dependent upon whether the rubber functions with the asphalt as a part of the cement which binds the aggregates of the pavement together, or as an aggregate in the pavement which is bound with the asphalt cement. An asphalt pavement containing a rubber-asphalt cement is tougher, and more durable, while those asphalt pavements containing a rubber aggregate are softer, non-abrasive and more resilient than asphalt pavements containing mineral aggregates. The properties desired in the playground surface dictate the type of rubber materials to use and their respective methods of construction.

With the increased use of outside recreational facilities such as around schools and in parks, playground officials are faced with the problem of obtaining the proper surfacing materials for each specific area. The choice of surfacing for the various areas should be based on the qualities of the surface desired for its intended use. Hard surfaces are required for such activities as roller skating, dancing, etc. The best material previously available for paving hard surfaced areas has been asphaltic concrete. The use of rubber in the asphaltic concrete produces a hard-surfaced, tough, elastic pavement with greater resistance to embrittlement as incurred at low temperatures or by aging, and less tendency to soften at elevated temperatures. Softer, non-abrasive, resilient surfaces are needed for areas in which activities are undertaken which often are accompanied by falls with the resulting dangers of abrasions, bruises and broken bones. Examples of this type of use are those for kindergarten and elementary school play areas, outdoor volley ball and basketball courts, etc. These resilient surfaces properly constructed with good rubber aggregates provide the best answer today to this need for softer, non-abrasive surfaces for play areas.

The proper choice of rubber materials and construction specifications for hard surfaced areas is important. The rubber products to be used should be designed for this particular use. The importance of choosing the right rubber materials has been shown in various publications, such as, "Investigations of Rubber Additives in Asphalt Paving Mixtures", by L. E. Gregg and W. H. Alcoke, published in the "Proceedings of the Association of Asphalt Technologists", Volume 23, 1954. Studies have shown that the most efficient method of producing an effective rubberized asphaltic concrete pavement is to blend the rubber latex (such as Firestone's Rub-R-Road Compound No. R-504) into the paving mixture at the pugmill of the paving plant. The latex is added after the hot aggregate is coated black with asphalt cement, and then the normal mixing cycle for asphalt mixtures is completed. An amount of latex is used which is sufficient to furnish a rubber solids content of 5 percent of the asphalt content in the paving mixture. The paving mixture is then easily laid in the same manner and with the same equipment as non-rubberized asphaltic concrete mixtures. The additional cost of using rubber over that for regular asphaltic concrete in small installations is approximately 18¢ per square yard for a typical one-inch thick wearing course over suitable binder and base courses.

Rubber Aggregates

Rubber aggregates as used in asphalt paving have certain characteristics not found in mineral aggregates which require that care must be exercised in the choice of materials and construction methods. Consideration must be given not only to the size, shape, gradation, hardness, and wear characteristics of the rubber, but also to adhesion, the effects of solvents on the rubber aggregate, and handling and compaction characteristics in the field. Over the past several years, through experimentation and construction experience, it has been established that durable rubber-asphalt pavements containing rubber aggregate

● **HARD-surfaced play area provides for roller skating, dancing and tennis, plus ice skating in the winter time.**

● **VOLLEY ball and basketball courts are surfaced with rubber asphalt which provides a resilient type of surface.**

● **RUBBER content was 5% of bitumen. Latex was added after coating of aggregate. This shows the final rolling.**

can be laid using a rubber aggregate similar to Firestone's Rub-R-Play Material No. R-109. Due to the nature of rubber aggregates, it has been found that the most economical, durable, resilient rubber-asphalt pavements that can be constructed with these materials are those installed with "penetration-type" construction. This method consists essentially of applying a triple surface treatment to a well compacted and bound base using a special rubber aggregate and a cut-back asphalt cement. The cost of labor and materials for applying this type of surfacing to a satisfactory base on a playground area of about 1500 square yards is approximately $1.90 per square yard for three applications of rubber. This cost will vary somewhat in different areas, depending upon the availability of materials, equipment and experience.

Complete specifications for constructing these improved surfaces have been compiled and are available, at no charge, together with other literature to which reference has been made by writing to the Rubber Paving Division of the Firestone Tire & Rubber Co., Akron, Ohio.

A Little Plant That Earned a MILLION

WOODROW W. CROSBY,
City Manager,
Seaford, Delaware

BACK IN 1937, the citizens of Seaford, Delaware, decided that a municipal power plant could meet the electrical needs of the community, maintain prevailing rates, and still yield profits for civic betterment. The little plant has grown and grown and, through the years, has earned net profits totaling more than a million dollars.

Both the nature of the physical growth and the method of handling finances are interesting. In 1939, two years after the first three 300-hp Fairbanks-Morse diesels were put into service, the building was expanded to permit installation of an 875-hp F-M engine and additional room was then provided for still another unit. In 1947, a 1200-hp diesel was put in the last open space, bringing the plant capacity up to 2,975 hp.

Since 1947, the Seaford plant has nearly doubled its capacity without enlarging the engine room. In 1951, a 1,600-hp. F-M opposed-piston engine took the space of one of the original 300-hp units. In 1954, a 1,920-hp unit was installed in the space vacated by another of the 300-hp engines. This brought plant capacity to 5,895 hp.

It was the original intent to utilize plant profits for civic improvement and this has been done. In the last four years, the plant has turned over to the City $232,000 for expansion and improvement of the water system and sewage disposal system, and for purchase of a fire truck. Definite provision was put into the City charter to insure the plant ample funds for necessary expansion and improvement and for replacement of worn or obsolete equipment.

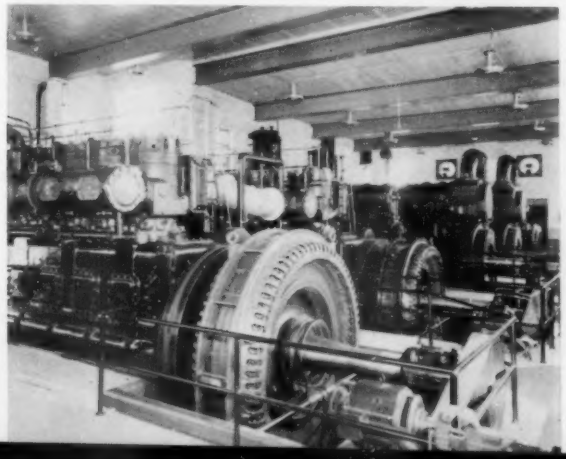
Peak load hit 2880 kilowatts last winter and promises to equal or exceed that level this summer. The balancing of summer and winter loads has been a healthy development at Seaford. The combination of three power-consuming feed mills and the growing use of air conditioners has built summer load and provided better utilization of plant capacity. The largest of the mills, which uses 500 kw, comes on and off the line without warning and the plant has to keep enough reserve capacity on the line to handle this load.

Installation of a 150,000-gal. vertical, cylindrical steel storage tank permitted fuel purchase in 125,000-gal. barge loads and saved enough on fuel costs in a single year to pay for the tank. From this tank, the fuel flows by gravity to 15,000 gal. and 25,000-gal. horizontal storage tanks and then is transferred by automatically-controlled pumps to the individual engine day tanks.

The municipal utility is managed by the author who also serves as City Manager.

● **THIS plant has earned more than a million dollars for Seaford, Delaware, in the past seventeen years of operation.**

● **THESE five F-M diesels carry the plant load which, in the period mentioned in the text was over 11 million kwh.**



New Method

Of Establishing TURF with the use of ASPHALT

WILBUR J. GARMHAUSEN, Chief Landscape Architect, Ohio Dept. of Highways

ASPHALT is a versatile material whose use dates back to the ancient days when history tells us it was used in the construction of the Tower of Babel, the waterproofing of boats and baths, and for the coating of mummy cases. Now it can add another use to its list, a mulching material, used in developing green roadside acres along our highways.

Turf, to have a part in highway consideration, must be established economically, maintained easily, and function satisfactorily. After years of experience in Roadside Improvement, the Ohio Department of Highways has arrived at a program which meets these requirements and we take pride in every further point of efficiency and economy that we add to it.

Two drastic changes in our seeding specifications for 1938, made mulching a very important and necessary item. Those changes were to eliminate the need for using any additional top soil, other than the quantity salvaged on the project, and to seed at any time during the year that an acceptable seed bed could be prepared.

The mulch, to serve its purpose, must be kept in place by one means or another. It has been the general procedure to use straw as a mulching material to protect the newly prepared seeded area and to promote grass growth. It was our opinion that asphalt in one form or another, could also be used beneficially.

While the use of asphalt in road construction is as old as history itself, the development of asphaltic materials for use in the field of Roadside Improvement, is just now emerging. Engineers and scientists have been exploring the possibility of using asphalt for soil erosion control and for mulching for some fifteen years. Great strides have been made and the results have become progressively more favorable. There are several methods that have been used with success.

Methods of Mulching

The first method used was the application of either a cutback or an asphalt emulsion sprayed over a seeded area. This thin bituminous film or mulch has a two-fold effect. First, it conserves and absorbs by virtue of its black color, any heat that is prevalent at the time of seed germination thus hastening the process. Second, it draws moisture to the surface, by capillary action, which is very necessary for subsequent growth.

Experiments in England in the late 40's used an application of 0.15 to 0.2 gallon per square yard. The experimental project we carried out in 1948, with the Scott Seed Company of Marysville cooperating, specified asphalt cut back at the rate of a minimum of 0.2 gallon per square yard on all areas except ditches where 0.3 gallon per square yard was used.

While this method of mulching has been successful it nevertheless has its drawbacks, primary of which is cost. The base costs of cut backs and asphalt emulsions are relatively the same. However, the price of either when calculated on the basis of 0.2 gallon per square

● **ASPHALT for mulching can be applied by hand, using a broom attachment. Detail of methods are described in text.**

● **SEED berm is being treated with asphalt, using a distributor. A special asphalt emulsion is used for this work.**

● **MULCH of two kinds is shown in this picture. In the foreground is straw; in the background, asphalt was used.**

● **DITCH has been treated with asphalt mulch, but has been sodded in the center to provide resistance to erosion.**

yard, in place, runs the cost of mulch between 3.5 and 4 cents per square yard. This is higher than the cost of a vegetative mulch alone.

Another method of mulching in which liquid asphalts can be used is by "tying down" the straw by spraying a thin film of bituminous material over the straw after it has been spread. This method, while proving successful, also has the disadvantage of a higher cost since it requires two operations, namely, the application of the straw and then the asphalt.

The third method of mulching in which liquid asphalt can be used, is the application of the straw and asphalt simultaneously. Working with members of the Finn Equipment Company and the American Bitumuls and Asphalt Company of Cincinnati, Ohio, and the Allied Chemical and Dye Corporation, Ironton, Ohio, we experimented with various grades of cut backs and asphalt emulsions. After nearly four years of testing the product which in the opinion of all concerned gave the best results, was an asphalt emulsion.

Asphalt emulsions are liquid by virtue of combining small particles of base asphalt with an emulsifying agent which prevents the asphalt particles from flowing together, and then suspending these particles in water. In either case the pure asphalt film which develops after application is a result of evaporation. In cut backs, the volatiles evaporate. In asphalt emulsions, the water evaporates immediately following application.

Stable Emulsions

We favor the use of a stable, viscous asphalt emulsion because there is no fire hazard in the handling of an asphalt emulsion since heat is not required in the handling and pumping. The emulsion can be used on damp terrain, straw or any type of vegatative mulch where cut backs have a tendency not to adhere. The emulsion is non-toxic, but it has one drawback common to all asphalts in that it is black in color. I am fully aware that a colorless product for use around bridges, buildings and guard rails would be desirable.

Emulsion Characteristics

What qualities, you may ask, makes a special asphalt emulsion best suited for use with a mulch spreader; and of equal importance, what qualities and advantages are imparted to the field of seeding and mulching by the equipment which has been developed? Why was a special asphalt emulsion chosen as being the best product for use with equipment that ejects straw and asphalt simultaneously over all grades of cut backs and other grades of asphalt emulsion. Briefly, the answers are:

1. It is a stable asphalt emulsion, nearly as liquid as water and easily handled without heating, for either bulk delivery or drums.

2. It can be used with damp straw without reducing its adhesive properties.

3. It atomizes easily thereby giving a uniform spotty tack to the mulching material.

4. The blast of air necessary to blow the straw, into which is sprayed the asphalt emulsion, rapidly dissipates the moisture in the material thereby giving an immediate tack.

5. The special asphalt emulsion, even though closely resembling some road type asphalt emulsions is by no means in that category. It was designed and is manufactured to meet the specific needs required of it. The base asphalt after evaporation of the moisture has a penetration range of 150 to 200.

Asphalt emulsion, together with equipment such as the mulch spreader, is no longer a fanciful dream of streamlining and economy in roadside development operations. It is a reality and is no longer an experiment. It is a tested, tried and proven means of mulching as evidenced by its successful use on our highways, our turnpikes, airports, military installations and private work.

The use of such equipment together with a special asphalt emulsion can be attributed solely to the fact that such an operation produces efficiency and results. In 1956, seeding was done on 4,800 acres of highway right of way, three-fourths of which was by this method.

We in the highway department are fully aware of the tremendous task which faces us in the light of the Inter-State Highway program. This task of controlling erosion and establishing turf is an important phase of road construction. The Inter-State Highway program will involve some 41,000 miles of highways. It is estimated that this will require some 800,000 roadside acres to be seeded. It must be realized that this is estimated as over and above what we, and you, consider our normal operations. It is a staggering undertaking but certainly not an impossible one. There is no doubt that the job will be done efficiently, economically and with excellent results. The unquestioned ingenuity and ability of Landscape Architects and Contractors throughout the country and the development and constant improvement of equipment and asphaltic materials will bring this important problem to a successful conclusion.

GOOD STREETS at Low COST

W. R. L. TAYLOR,

City Manager,

Missoula, Montana

In a program to restore its 240-mile street system to modern standards, Missoula, Montana, has relied on judicious equipment purchases and use of local materials.

THE HIGHLY successful method adopted by Missoula, Mont., to solve the problem of improving its wornout streets is a program of restoration by combined City and contractors forces, with financing by a voluntary assessment system of public payment. Missoula's street muddle is the story of a street system which just grew in the early days, streets too often were laid out with no regard to a master plan of growth or to such engineering factors as type of material, loading values, and drainage. Up to a year ago, not a single mile of storm sewer had been constructed to take care of an ever-increasing demand. As a result, rain and snow runoff waters frequently ponded from curb to curb in the streets.

Further to complicate the street problem, little had been done in the way of construction or maintenance for more than 20 years. Equipment and labor were almost impossible to procure during the war years, so the street system naturally suffered. A few years ago the entire roster of serviceable City-owned equipment combined only two pre-1941 motor graders, two usable dump trucks, and a fairly good asphalt distributor which was mounted on a completely worn out truck chassis. The City had no pneumatic rollers or steel-wheel rollers.

Realistic Appraisal Made

It was obvious to everyone from mayor to average citizen that something must be done to restore the street system to modern standards at moderate cost. To get started as quickly as possible, a realistic appraisal was made of all factors bearing on the general situation. Geologically, Missoula is blessed with a wonderful site: the city sits on a highly pervious, ancient lakebed. It has excellent bearing value, and is well drained. Economical construction seemed possible by the simple expedient of ripping out the old street surfaces, rebuilding flexible granular sub-bases where necessary, improving drainage grades and by providing dry wells at critical points. Dry wells would drain the runoff water down into the gravelly subsoil.

● **WHAT can happen to a street when surface, base and drainage are inadequate.**

Under Montana law, Missoula's only source of revenue is a ten-mill tax levy and fund raising by authorization of special assessment districts. Of $110,000 raised by the ten-mill levy, a net of only $70,000 is available for the 240-mile street system — less than 20 percent of which is high-type pavement and sub-base. Montana law prohibits cities from taxing motor vehicles in any way, and the usual pro rata share of registration fees and fuel tax money in Montana is returned to the counties; not to the cities. Cities must raise their own money for street improvements.

This realistic appraisal of all the factors resolved itself into a common sense solution. A method had to be decided so that sound, modern 1956-model streets could be constructed at the lowest possible cost to property owners who would share financial responsibility for such reconstruction. To that end, roadmixed bituminous paving was settled upon as the major type of surfacing, and that was to be placed on adequate base construction, with ample drain-

age provisions. A major network of good arterial streets leading into all parts of the city was laid out, so that there would be main thoroughfares of access into practically every neighborhood on these main streets. The construction season of 1955 saw some 55 city blocks restored to modern standards by new paving, subbase, and the installation of vertical drains. In the same year, 180 city blocks were given many more years of useful service life by bituminous sealcoating and an application of stone chips.

Equipment-wise, the City purchased a minimum number of units, all of which were designed for heavy sustained service. It purchased two more graders—Caterpillar No. 12's. The entire roadmixing job was handled by a new Seaman - Andwall Trav - L - Plant Pneumatic and heavy steel-wheel rollers also were purchased, as were four heavy-duty dump trucks capable of hauling up to 24,000 pounds of payload if necessary. Two tractor-mounted front-end loaders and some snow plowing equipment for truck mounting also were purchased with the street program in mind. A small crew of dependable employees, supervised by one street foreman, was picked for the operation of this equipment.

In setting up this crew and equipment it was not the City's intention to set up a force-account labor crew in competition with local contractors. Many times, in fact, City equipment and crews have joint-ventured on projects with available contractor's crews and their equipment. On a rush job which the City now is doing, for example, where portland-cement concrete is called for in a downtown area, City equipment and operators will be used if necessary by the contractor, who will reimburse the City for the use of such equipment and men. Construction of concrete curbs and gutters, the dry-well type of drain, premixing of patch material for bituminous streets, and some plant-mixed asphalt surfacing has also been farmed out to contractors on a regular basis. Thus it becomes a partnership; not a competitive enterprise against contractors.

Good Roadmixing Method

A fast moving, efficient system of restoring city streets has been devised around the skills of the crew and the adaptability of equipment. Street improvement work now is on a purely voluntary basis so far as the general public is concerned. If the majority of property owners in any block petition the City Commission for street improvement, the betterment work goes forward rapidly. Average cost to property owners is approximately $3.30 per front foot of property exposure along the street—and this includes the "full treatment": pavement restoration, correction of grade, rebuilding of sub-base, and construction of drainage wells. Routine sealcoating, by comparison, costs 60 cents per front foot.

The old pavement surface first is ripped up by motor graders, which sometimes work in tandem with one machine used as a pull unit in areas where pavement had been thickened over the years. The old bituminous material is windrowed for salvage in restoring the surface to original or better condition. Grades are then rebuilt to better drainage standards by installing curb and gutter lines. These subgrade areas are carefully bladed and then compacted by both pneumatic and steel-wheel rollers. A cushion-course material, ¾ inches and under in size, is then laid and spread to a tolerance of ¼-inch in ten feet by the motor graders. This is compacted to high density. All crushed gravel and aggregates are produced locally under contract, so that proper gradation specifications can be exercised to get a much better product than the City would probably turn out if it had its own equipment. A river bank pit near Missoula supplies most of this material, which is hauled in by bottom-dump units which carry up to 20 tons per truck.

The Seaman - Andwall Trav - L - Plant method of roadmixing the paving surface has worked out excellently and at low cost. Crushed rock aggregates for such pavements are produced under contract, and either hauled directly to the city streets where restoration work is to be done, or is delivered to a large mixing table not far from the center of the city. Crews of four men have developed a method using this equipment, where a 600-ton, 450-cubic - yard windrow of aggregate can be separated and mixed out with 6,000 gallons of MC3 or MC5 asphalt in less than six hours working time.

The usual method is to deliver the bitumen in transport trucks at application temperature; to hook these transports direct to the metering and pump equipment on the Trav-L-Plant; and to apply the oil in a single pass after cutting the windrow into several smaller segments. This arrangement is nice because it frees Missoula from the usual rail-hauling and reheating problems.

In cases where only a small amount of material is to be processed, the oil is applied by a pressure distributor. Most of the time, however, the bitumen is supplied directly through the Trav-L-Plant. Crushed aggregates and bitumen then are roadmixed by making repeated trips through each windrow with the Trav-L-Plant, and following these trips with a blade turning of the material for another exposure to the mixing process. In hot

● **PROGRAM developed by Missoula resulted in wide and well paved streets.**

weather, where climatic conditions are favorable, only four to five passes are necessary to develop a complete blend of asphalt and mineral filler. If the mixing is done directly on the street, the material is laid down to finish grade by the motor graders, and compacted by both pneumatic and steel-wheel equipment. If the mixing is done on the mixing table, the material is picked up by one of the front-end loaders and truck-transported to the street, where it is laid down by motor graders in the usual way. When the surface texture is right, the surface is sealcoated.

This roadmixing program has worked out well for Missoula. It has permitted speed during short construction seasons; it has saved money for property owners who foot the bill; and it has helped greatly to close the gap between the type of streets which this beautiful city once had, and the modern street system which it deserves. Costs have been approximately 50 percent of what they would be under a straight contract system, using plant mix pavements.

● **ASPHALT mix which is being developed on a mixing table is inspected by City Manager W. R. L. Taylor of Missoula. A Seaman-Andwall plant is shown in the background. The program worked well and resulted in economies for taxpayers.**

● **WINDROW of aggregate and bitumen is being mixed with the City Manager, riding on the hood, watching operations.**

● **ROAD-MIX procedure was especially advantageous here because of the short construction season and need for speed.**

● **TO MAKE a satisfactory mix, four to five passes of the mixer were needed. Aggregate windrow left, grader at rear.**

● **TWO motor graders, the Seaman-Andwall mixer and a distributor teamed together to mix 250 c.y. in three hours.**

● WATER requirements for the future, as determined by his study, are being outlined to City Council by the author.

A *Future* WATER REQUIREMENTS STUDY

HARRY A. SQUIRES*

Lakewood, California

LIVING IN Lakewood, California, in an area that is semi-arid and dependent for much of its water supply upon the Colorado River, more than 200 miles distant, I have thought of waking up some morning and finding that there was no water. Information published in the Los Angeles newspapers revealed that the annual rainfall was progressively decreasing and that the water table was dropping. With this in mind, I attempted to discover what the water requirements of Lakewood would be 10 years hence and whether the citizens could be reasonably certain that these requirements could be met. If evidence indicated that the requirements would exceed the supply, I wanted to find out what measures could be taken to preclude a future for Lakewood that was characterized by an inadequate water supply.

The study I subsequently made was conducted wholly as a private citizen of Lakewood and was in no way connected with my affiliation with Holmes & Narver, Inc.

Lakewood is in Los Angeles County, northeast of Long Beach. Annual rainfall at Los Angeles, about 15 miles northwest of Lakewood, averages 15.1 inches, and is normally not more than 20 or less than 10 inches. Extremes recorded, however, are from 5 to 40 inches. Rainstorms ordinarily occur between November and April, the largest amount of precipitation being in the three winter months.

It was determined at the beginning of my research that the prediction of the water requirements of Lakewood for 1967 would be based on three factors: population growth, land use, and the increased use of water in our technological society. After research of the literature of the field and talks with top engineers in the profession, I set about the task gathering information, developing the data and finally refining it into a formal report which was presented to local officials, county officers, and California Governor Goodwin Knight, who has shown a keen interest in water affairs.

The purpose of the study was to make Lakewood city officials aware of the water situation and to attempt to create a public concern for the necessity of additional study of this important subject.

Present Consumption

The figure of 100 gallons per capita per day is frequently used as an average rate of consumption. Information from the Lakewood Water and Power Company showed that the maximum daily consumption per capita was about 150 gallons. Assuming a total of 4.5 persons per residence, the maximum daily consumption at present per residence in Lakewood is 675 gallons. However, this figure is probably true only for a few extremely hot, dry days in midsummer, when homeowners use large amounts of water for lawn sprinkling.

Surveys conducted by engineers indicate that the water used by a community generally falls into four groups with relative percentages as follows:

Use	*Percent*
Domestic purposes	35
Industrial and commercial	40
Public (schools, parks)	10
Waste and leakage	15

However, in the case of Lakewood, with a predominantly residential population and a minor industrial complex, the percentage for domestic purposes should be increased to about 65 percent. Additionally, the percentage for industrial and commercial use should be reduced from 40 to about 10 percent. Thus, the water consumption percentage breakdown should be revised, as follows:

Use	*Percent*
Domestic purposes	65
Industrial and commercial	10
Public	10
Waste and leakage	15

Although figures for many years were not obtainable, the water consumption totals for 1956 indicated that peak consumption months are July and August with consumption of 470 mg and 444 mg respectively; and that January and February with 217 and 198 mg are the months of least consumption. In view of the fact that tremendous quantities of water are used for lawn sprinkling and soaking during the hot spell in July and August, it can be assumed that water consumption figures for the next 10 years will follow this same pattern.

Present Water Supply

Water for Lakewood is obtained from 24 wells located throughout the city. The wells are integrated into a well-organized grid system,

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so that, in an emergency, a well in one area can use part of its storage capacity to serve another area. Pressure throughout the system is maintained at 60 psi. When the pressure falls below 55 psi in any part of the system, the closest well auto-operation until the pressure reaches 75 psi, when the well supply is automatically cut off. Pressure at consumers' meters is from 50 to 55 psi. To supply water during an emergency, approximately 7 million gallons of water are stored in tanks throughout the city and in a reservoir.

Aquifers from which the water supply of Lakewood is taken are recharged by deep percolation of precipitation on and surface flow across the Montebello Forebay, an area of about 41 square miles located west of Whittier and south of Montebello. However, in addition to recharge from natural sources, the Los Angeles County Flood Control District has purchased and spread, under its Zone 1 Program, an average of about 27,000 acre-feet of Colorado River water each year for the past three years. This spread water has been of material assistance in the recharge of the Central Basin.

The factors which affect the rate and direction of ground water movement are permeability and the piezometric head, or the difference in pressure between two points. Water levels south and west of the City of Lakewood are lower than those in the vicinity of neighboring communities, such as Bellflower, Paramount, and Downey, and are among the lowest in the Central Basin. Thus, the head available for ground water movement is greater in the direction of Lakewood than in the direction of the Downey-Paramount-Bellflower area.

Future Water Requirements

Estimates of future water requirements must be based on a study of the factors affecting increase in population and the use of water. The population of Lakewood at the time of incorporation was 71,316. Assuming that approximately 2000 homes will be constructed on the remaining acreage set aside for residential use during the next 10 years and also assuming a slight increase in the average family size, Lakewood officials predict a 1967 population of about 80,000. The average monthly water consumption in Lakewood in 1956 was 330 million gallons. Estimating water requirements 10 years hence, we arrive at a monthly water total slightly over 371 million gallons, based on the current rate of water use. Additionally, we can validly assume that the 80,000 Lakewood residents of 1967 will consume larger amounts of water for such home appliances as air-conditioning, dishwashing machines, home laundry machines and other equipment. Thus, for the purpose of this study the average monthly water requirement in Lakewood for 1967 is estimated to be 450 million gallons. Since Lakewood is almost completely residential with a minor industrial character, no appreciable changes are contemplated in industrial water use for the coming 10 years.

Future Water Supply

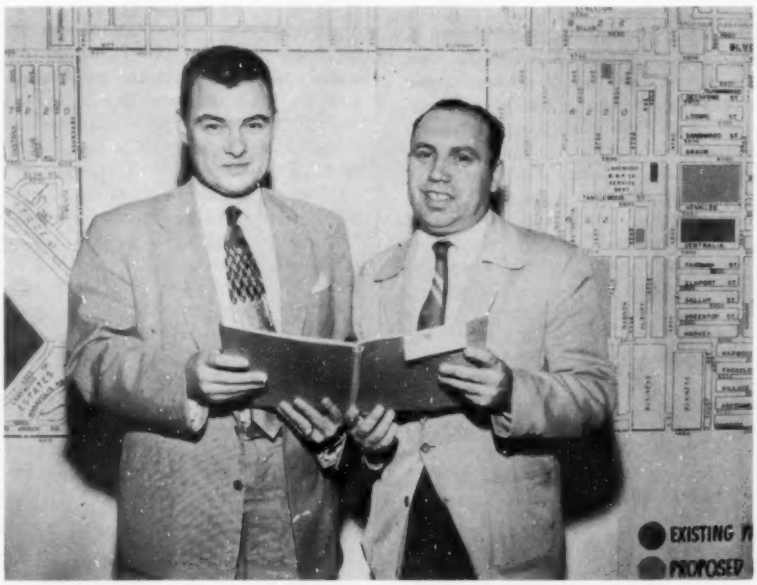
Since the water supply in Lakewood is dependent upon the rainfall in the Whittier area, we must make several assumptions concerning the future in view of the fact that only Providence can predict rainfall. If we assume that the rainfall curve in the Whittier area will remain on a plateau, the present water supply, plus the storage capacity, will be adequate to meet the demands during the coming 10 years. Engineers and scientists are talking confidently of being able to reclaim sea water economically in the near future. However, it is considered prudent and conservative to assume that this will not be an actuality by 1967.

It has been pointed out that extractions from the Central Basin have exceeded replenishment to the Basin for many years. Under this condition, water levels in the Central Basin have dropped many feet during the past several years and, unless there is a large reduction in the amount of extractions, levels may be expected to continue to drop. While this downward trend might be interrupted by an extended series of wet years accompanied by high recharge of the Montebello Forebay, the interruption would be of a temporary nature and would be expected to be followed by a drop in levels to depths even greater than currently experienced.

Recommendations

The following recommendations were made:

1. The City of Lakewood, with the active cooperation of local newspapers, service clubs, PTA's and other organizations, should undertake a continuing public education program aimed at reducing waste by water consumers.



● WATER study is presented by author to Mr. Goerlick, Acting City Administrator.

2. The Lakewood Water and Power Company and the Metropolitan Water District of Southern California should conduct a joint engineering study to determine the most feasible point where a tie-in of facilities may be made. This information should be obtained now, not at a critical time when the water supply of the MWD may be urgently needed.

3. A study should be authorized every five years to pinpoint areas in the water complex which require City Council action.

Subsequent to the conclusion of this study, information was for-

warded to me that hydrological studies have revealed an increasing amount of sea water intrusion through the Los Alamitos Bay, south and east of the City of Lakewood. It is readily apparent that if this sea water reaches the Lakewood area, it will affect adversely the potability of the city's water. Therefore, it is recommended that a close and regular check be conducted to chart the intrusion of sea water.

Results of Study

The Metropolitan Water District of Southern California received a copy of the study with thanks and turned it over to their Chief Engineer for study. The Board of Supervisors of Los Angeles County adopted an order referring the report to the County Engineer, J. A. Lambie. Max Bookman, District Engineer of the California Department of Water Resources, wrote, in part:

"This report was reviewed with interest, and you are to be congratulated not only on its contents but also on a fine presentation. Unselfish interest and work by civic minded citizens such as yourself is of great interest in the solution of water supply problems such as you discussed in your report.

"In general, it may be said that your evaluation of problems appears excellent, and based upon the statistics you present, your estimate of water requirements for the City of Lakewood in 1967 appears reasonable.

"Your report shows much thought and care in preparation. I again wish to compliment you on being so greatly concerned with the problems of water supply which are of such great importance to all the citizens of California."

Copies of the study were presented to the Mayor of Lakewood and each of the Councilmen. The Council referred the study to Acting City Administrator Henry Goerlick and City Attorney John Todd for study. At a regular meeting of the City Council, Mayor Angelo Iaceboni said to the author, "You are to be commended for your civic consciousness."

Governor Goodwin J. Knight of California wrote to the author of the study: "Let me congratulate you for making such an excellent contribution to the welfare of your community. Your report reflects the thoroughness of your study and clearly presents the water problems facing the people of Lakewood.

"Your estimate of the rapid growth of Lakewood in the next ten years and the expected corresponding increased need for additional water supplies is representative of what is occurring in many parts of our State. This is the reason I am most anxious that the Legislature act promptly in getting under way the initial units of The California Water Plan.

"Lakewood should be proud of your contribution as a civic minded citizen. It is only by the untiring efforts of citizens such as yourself that the people of California will be able to solve the problems attendant with our State's growth."

SMALL HIGH RATE TRICKLING FILTER PLANT

C. W. PATE

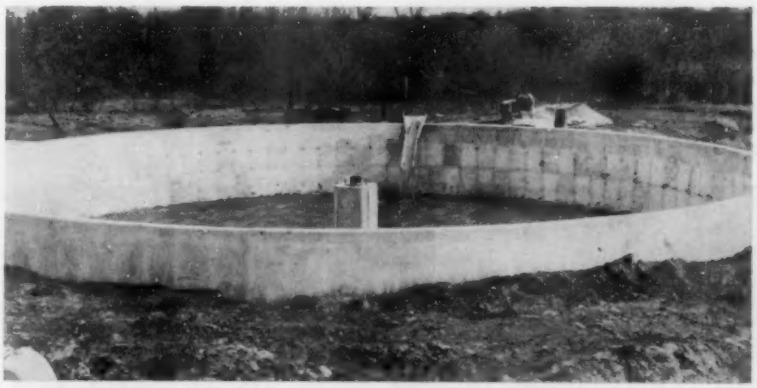
Chief of Engineering Design,

Pate Engineering Company,

Tulsa, Oklahoma

THE SEWAGE TREATMENT plant for Drumwright, Okla., was designed for an average flow of 650,000 gallons per day. It consists of a grit chamber with American Well Works equipment; a 36-ft. diameter by 7-ft. swd circular primary with a Walker collector; and a 68-ft. diameter trickling filter with American Well Works rotary distributor. Provision is made for recirculating from the filter effluent back to the primary. The filter is dosed by sewage pumps from a wet well at the control house and the sludge is pumped from the primary clarifier to a 30-foot diameter by 29.5-ft. swd digester, which is at an elevation that allows flow to the sludge drying beds by gravity. The sewage pumps were furnished by Aurora with motors by Allis-Chalmers. The sludge pumps and digester mixer were furnished by American Well Works.

Probably the main reason for selecting a trickling filter for this project is the ease and simplicity of operation of such a plant. We feel this is very important in a relatively small city which cannot afford to pay the salary of a highly trained operator such as is required in many other types of plants. Of course the first cost was also a big item in this case, as is usual with a small town.



● **FILTER is 68 ft. in diameter; underdrains have been placed ready for media.**

As this is actually little more than a primary treatment plant, the filter has another advantage in this way: It was designed for the low range of a high rate filter at design flow which allows for approximately 30 percent average recirculation at present flow. This dilution back to the primary will further reduce the BOD in the effluent and reduce the need for final treatment at a later date. The filter is very flexible as a high rate filter at 10,000,000 to 30,000,000 gallons per acre per day and will handle a wide variation in flow without too much of an operation problem. Also it is very easy to expand the final treatment if and when needed.

The author handled the preliminary and process design and worked with W. H. Minor and R. N. Strickland on the detail design. All are from the University of Missouri as is C. C. Pate, President of the firm.

THE CITY *THAT CAME BACK*

JACK MULLEN,

Member Board of Directors,
Beautify San Antonio Association,
San Antonio, Texas

WHAT HAPPENS when a city loses its self-respect? The citizens of San Antonio, Texas can tell you. They saw their community change from beauty to ugliness within a decade.

Prior to World War II, San Antonio enjoyed an international reputation as a community of beauty and distinctiveness. Its parks were cool and artistically landscaped; its palm-lined streets were clean and led past inviting and well-kept homes. Files of the Chamber of Commerce bulged with letters of praise from visitors who complimented officials on the community's attractiveness which was second only to the hospitality of its people. Tourists came from near and far to enjoy the city's warm winter sunshine, to visit its Spanish Missions and to see the historic Alamo.

With the advent of World War II, a gradual change took place in San Antonio. Streets became dirty and unkempt; homes were permitted to run down; parks took on signs of neglect as plants and shrubs were allowed to die; and grassy plots became overgrown with weeds. San Antonio had achieved an "uncared for" look. It was evident to even the most casual visitor that the City and its citizens had become indifferent to appearances. The people had lost pride in their community, their homes, streets and public places.

● **MISS BEAUTIFY and her court get roses from Mr. "O. P." Schnabel.**

● **TROPHIES won by San Antonio during recent years are indications that city has progressed a long way from the rundown condition following World War Two.**

Their attitude was reflected in letters received from visitors, many of whom had known and enjoyed the San Antonio of another era. Instead of praise, there was criticism of the debris in streets and parks. Many of the leading citizens were ashamed of the change that had come about, but few seemed to have the will or desire to do anything to remedy conditions until one day a life insurance man, O. P. Schnabel, returned to his home town following a tour of Europe, and was shocked into action when he compared some of the beautiful towns in Switzerland he had visited with his own community. Mr. Schnabel went to the Chamber of Commerce with his plea that something be done. Officials listened and offered their support, but lack of pride and indifference had become firmly entrenched. Even with the backing of the city's civic leaders, the movement to regain San Antonio's position as a city of beauty met opposition on all sides.

Nevertheless Mr. Schnabel carried on his attack against litter and debris. The fight began in 1948. Only meager results were achieved immediately. Mr. Schnabel and his supporters met with much discouragement but carried on in their efforts to arouse public opinion and to dispel apathy. Newspapers, radio and TV stations were generous in

their support. Financial help came from business firms who recognized the dollars and cents value of a clean city to their businesses.

One of the major causes of the city's unsightliness was the inability or unwillingness of the City Administration to haul away householders' trash at periodic intervals, with the result that much debris had accumulated. In order to heighten the impact of the campaign, Mr. Schnabel and his committee initiated an annual trash haul in which private firms donated trucks and helpers. The first such haul, inaugurated in 1949, resulted in thousands of tons of trash being removed from homes and yards. These annual trash hauls are believed to have saved citizens a million dollars in private trash toting fees. So impressive were these events that citizens at last began to open their eyes to the realization that their city had "gone down the hill." More residents joined the campaign and began to help—pitching in where help was needed most—in their own homes and yards.

In 1951 the city won its first National Cleanest Town award in a contest sponsored by the National Clean Up-Paint Up-Fix Up Bureau in Washington, D. C. Since then San Antonio has won an award every year, in 1954 winning the National Grand Award over all cities in the nation. San Antonio's clean-up efforts started as an activity of the Chamber of Commerce, but today leaders of the movement have their own organization, the Beautify San Antonio Association, which operates in cooperation with the Chamber of Commerce and with other public and civic organizations throughout the City. Mr. Schnabel organized the Beautify San Antonio Association, served as its first president and now has taken over the job as secretary.

● **SKUNK mascot of Beautify San Antonio Association was used effectively to focus attention of citizens on the many violations of the sanitary regulations.**

● **CONDITION of typical corner property before the clean-up program started.**

● **SAME property as above after cleaning. Someone did a lot of work.**

The council has appropriated funds to aid in recent clean-up campaigns, and it is expected that this year the City will take over this endeavor entirely by supplying trucks and men for regular periodic pick-ups

Some of the more tangible and successful activities that have been incorporated into the program follow:

1. More than 750 trash cans now have been located at busy corners and in parks to encourage citizens to keep streets and parks clean. It is estimated this one project has saved the City thousands of dollars in trash pick-up labor.

2. San Antonio's elementary and high schools have been brought more actively into the campaign through essay contests, poster contests, school check lists and other projects which have brought about cleaner school grounds and cleaner, more beautiful homes through pressure exerted by the children on their parents.

3. The City has increased its street sweepers from two to six which means streets now are regularly cleaned.

4. The City Health Department regularly notifies owners of unkempt lots to clean up, and when they fail to respond, the Department cleans up for them, billing the owners.

5. The Beautify San Antonio Association this past year initiated monthly awards to firms who have improved the looks of their buildings and grounds by cleaning up, painting up and fixing up. This project has met with much success and is building good will for the Association.

6. Through the sponsorship of the Chamber of Commerce and the San Antonio Conservation Society, local nurserymen in 1956 sold at wholesale, 12,000 trees to citizens for planting in their own yards.

7. Meetings with right-of-way foremen of San Antonio's three railroads have brought about their cooperation in cleaning up and beautifying railroad rights-of-way into the city.

8. The City Administration, through its City Manager, now has initiated regular trash pick-ups, and it is probable the annual trash haul sponsored by the Association may be discontinued and replaced with other efforts.

● **ROUND-UP, San Antonio clean-up style. Volunteer trucks and workers are ready to start annual trash haul. These events were factors in selling program.**

9. In an endeavor to make citizens anti-litter conscious, thousands of litter bags have been distributed, encouraging users to place them in their cars.

10. Efforts to enlist the support of citizens in push-brooming curbs in front of their homes have been intensified through the year.

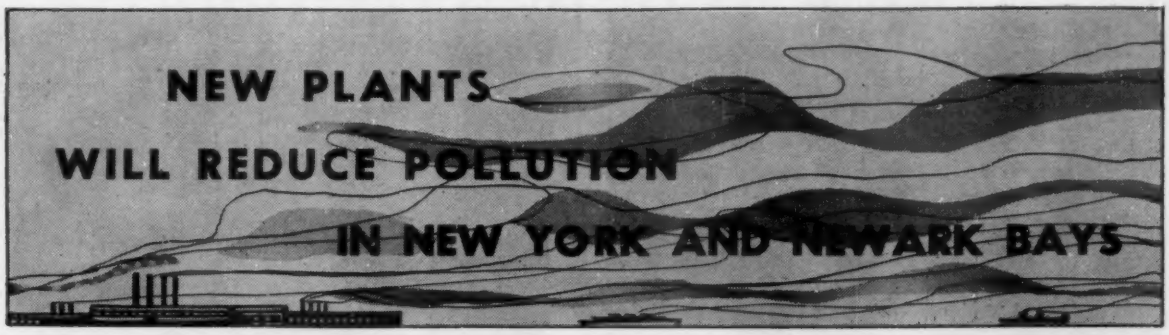
At the start of the crusade for cleanliness, leaders of the movement felt conditions were so bad that the first step in the campaign should be the elimination of the accumulated trash and debris. Initial activities were designed to remove community eyesores. Through the years many of the conditions which made this campaign necessary have been eliminated.

Currently, leaders of the movement are working to avoid a recurrence of past conditions by carrying out a "Prevention" campaign. The use of litter bags, trash receptacles, and regular trash pick ups by the City, along with the designation of regular dumps where trash can be deposited, are aiding in this phase of the campaign. Simultaneously, the Association also is carrying on a movement to get at the causes of trash before they get started. To prevent litter and trash from falling from trucks, the City of San Antonio passed an ordinance imposing a fine of $10 to $100 if a driver does not have a secure cover when hauling trash. A group of 100 "Beautify Reporters" has been organized to note violations. Periodically a group is stationed along the route to the city dumps to record the license numbers of trucks which violate the ordinance. A friendly warning is then sent to the truck owner with a copy of the Ordinance. Beautify reporters also report license numbers of cars from which litter is thrown. The owner received a friendly warning asking him to cooperate in making San Antonio and America Cleaner and More Beautiful by "Refusing To Be A Litterbug". An auto litterbag is also sent to the violator.

Association officials have found that a great amount of litter comes from uncovered garbage cans or uncovered trash boxes, which are a violation of the City Ordinance. A friendly violation notice is sent to the violator, and in 90 percent of the cases the situation is corrected; the others are referred to enforcement officials for legal action. Drive-in eating places are a source of stray litter. These places are "needled" continually to have their "car hops" pick up any napkins or other litter that may be discarded by customers.

As a long range program for making America litter free, Beautify San Antonio Association officials feel that future automobiles should have built-in trash receptacles. To focus attention on this addition, members are now circulating five thousand petitions. The petitions urge auto manufacturers to include built-in receptacles that can be removed easily and kept sanitary. They feel that 90 percent of Americans will cooperate and not be "Litterbugs" if they have a place to put their litter while driving.

● **TWO $2 bills went to the man who did not pass up this "plant" of refuse.**



TWO SEWAGE treatment plants are under construction by Jersey City, N.J. These, which are now about 80 percent complete, will provide primary treatment for an ultimate sewage flow of 82.6 mgd. Though the danger to health and depreciation of property from untreated sewage was recognized more than 50 years ago, the usual problems encountered in providing sewage treatment, plus litigation, delayed the start of construction until October, 1954.

The sewerage system is of the combined type, with 42 outlets into the adjacent waters — New York and Newark Bays and the Hackensack River. Intercepting sewers had to be provided and two plants were necessary because of the topography of the city—one on the East side bordering New York Bay and one on the west side along the Hackensack River. Regulators were provided to pass excess flows during storm periods through existing outlets. All flow through interceptors is by gravity.

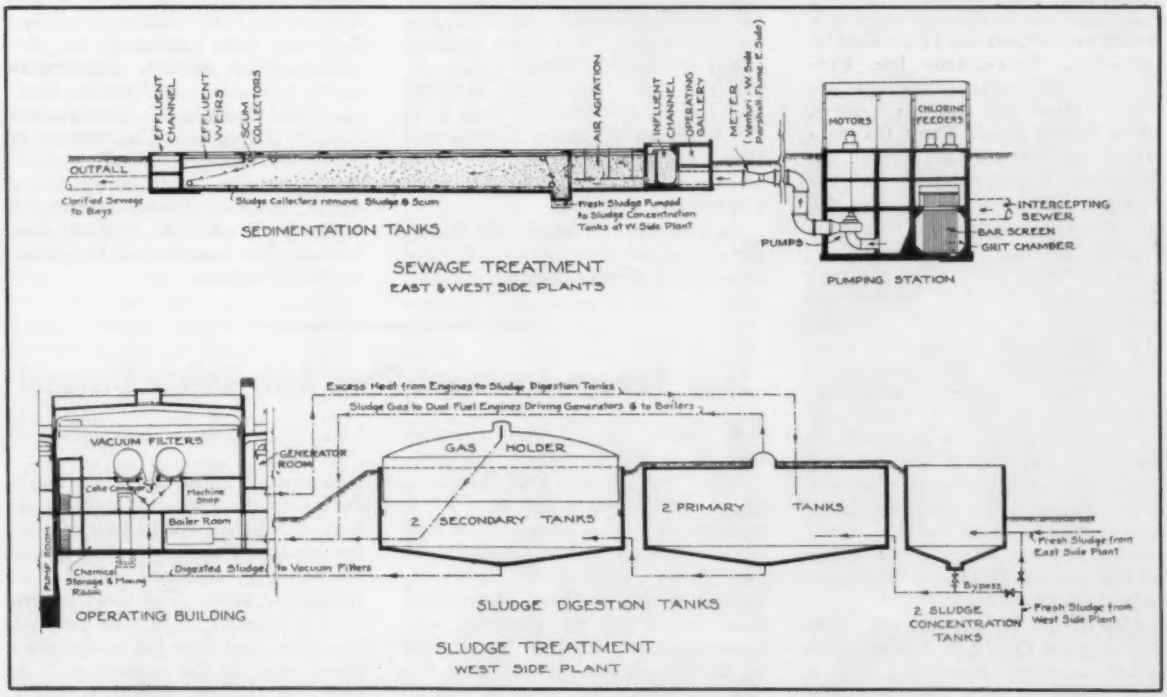
The East plant has a capacity of 46.6 mgd; the West plant capacity is 36 mgd. General treatment is the same at both plants. Mechanically cleaned screens and grit chambers precede the pumps which pass the sewage through a Venturi meter at the West plant and through a Parshall flume at the East plant. Rectangular sedimentation tanks are preceded by mixing tanks with air agitation to increase the effectiveness of the settling process by flocculation and by distributing the flow over the sedimentation tank cross-section. Sedimentation tanks are equipped with mechanical sludge and scum removal devices.

Fresh solids are removed from the sedimentation tanks by pneumatic ejectors which permit removal at a slow controlled rate. Sludge from both plants is pumped to sludge concentration tanks at the West plant, and thence to digesters. It is then dewatered on vacuum filters of the coil spring type. Digester gas is utilized in dual fuel engines to provide power for both plants.

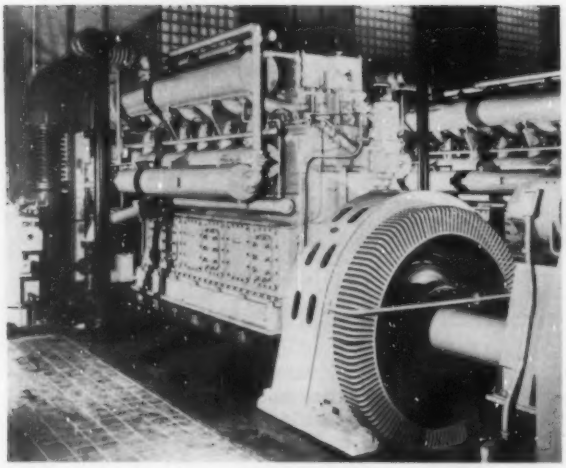
The Treatment Plants

In addition to the Operations Building, there are six aeration-sedimentation tanks at the East plant. These are each 160 ft. long by 66.5 ft. wide, with a depth of 14 ft., providing a retention period of 3 hours. The four raw sewage pumps are Worthington and the total pumping capacity is 12.8 mgd.

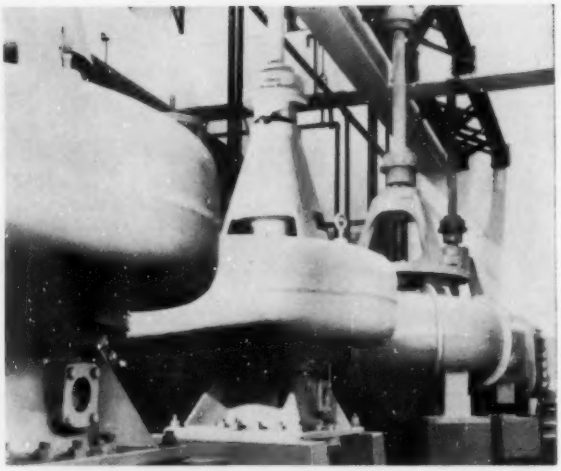
At the West plant there are an Administration Building, an Operations Building and a Chlorine Build-



● **WEST Side plant profile above, showing pumping station, aeration and settling tanks; below are sludge treatment units.**



● POWER for both plants will be provided by three Worthington dual-fuel engines with a total output of 2,079 KW.



● INSTALLED pump capacity at West Plant will be 84 MGD, provided by four Worthington vertical centrifugals.

ing in addition to the treatment plant units. These consist of five sedimentation tanks each 150 ft. long and 66.5 ft. wide, with 14-ft. sidewater depth; two sludge concentration tanks each 40 ft. in diameter and 35 ft. deep; and four 100-ft. diameter digesters 32 ft. deep. Two of the digesters have fixed covers, with mixing equipment for circulating the sludge; the other two are of the floating cover gas holder type. Sludge dewatering is by four 11.5 ft. by 13-ft. Komline-Sanderson coil spring type vacuum filters which are located in the Operations Building.

The bar screens, grit handling equipment and sludge and scum collecting mechanism were furnished by Link-Belt. Dorr-Oliver Inc. supplied the equipment for the digesters —the mixers and the gas holders, while Pacific Flush Tank Co. furnished the heat exchangers and gas collection appurtenances for the digesters. Blowers, air diffusers and grit chamber equipment was supplied by Chicago Pump Co.

At the West plant there are four Worthington vertical centrifugal pumps with a maximum capacity of 84 mgd. These and the East plant pumps, are driven by synchronous motors. Two are equipped with magnetic drives by Electric Machinery Co. which give variable pump speed; the other two pumps are constant speed. The variable speed magnetic drives maintain the pump discharge rate always to equal the rate of incoming sewage, varying the speed of the pumps gradually and uniformly.

Also at the West plant are three Worthington dual fuel engines with direct-connected generators with a total output of 2079 KW. Available digester gas will be used to drive these engines but gas may also be used for building heating in addition to heating the digesters.

Provision is made for chlorination which is from Wallace & Tiernan equipment. The required contact period is provided by a detention tank at the West plant and by a long outfall at the East plant.

Ground conditions at the West plant were unfavorable as it is built on the site of an old city dump. As a consequence, the plant is supported on 5,000 cast-in-place concrete piles.

Clyde Potts Associates of New York City are the consulting engineers. The general contract is being performed by a joint venture called the Garden States Constructors and Associates which is composed of Joseph Miele & Son, Inc.; C. Salvatore & Sons; George M. Brewster & Son, Inc.; Terminal Construction Corp.; and La Fera Contracting Co., Inc.

As indicative of the variety of materials and services required in constructing a sewage treatment plant, the following firms, in addition to those already listed, supplied equipment:

Westinghouse Electric Mfg. Co., switchgear, transformers and appurtenant materials. S. Morgan Smith, hydraulic roto-valves. Ralph B. Carter Co., sludge ejectors and sludge pumps. Yeomans Bros., sump pumps. Krajewski-Pesant Mfg. Co., tide gates and pressure relief valves. A. P. Smith Co., valves. U. S. Electrical Motors, Inc., motors. Simplex Valve & Meter Co., Venturi Meter and Parshall flume recorder. Preload Co., prestressed digestion and sludge concentration tanks. Maxim Silencer Co., heat recovery silencers. C-O-Two Fire Equipment Co., fire extinguishing system. Moretrench Corp., well points and pumps. Rodney Hunt Machine Co., sluice gates. Metalab Equipment Co., laboratory equipment. Minneapolis-Honeywell Co., automatic controls for jacket water cooling. Roots-Connersville blowers. Brown & Brown, Inc., sewage flow regulators for intercepting chambers.

Joint Sewage Treatment Plant Adds Refuse Disposal

A jointly owned and operated sewage treatment plant was constructed by Neenah and Menasha, Wisc., twenty years ago as a PWA project. Now it is proposed to add incineration for refuse disposal, and for sludge destruction as well, though sludge has been incinerated from the beginning. Proposed improvements will include installation of Komline-Sanderson vacuum filters for dewatering up to 36 tons of raw sewage sludge per day and two 150-ton Combustion Engineering incinerators.

Estimated initial daily loading in the plant is 12 tons of garbage, 55 tons of rubbish and 14 tons of sewage sludge. The incinerators are of the bin-type, equipped with a Harnischfeger crane. The flash dryers, with a capacity of 36 tons per day, will draw heat from the incinerators. Total cost of the project will be about $1 million. McMahon Engrg. Co. of Menasha are consultants.

IMPROVING PUBLIC WORKS
through
MANAGEMENT RESEARCH

This paper outlines opportunities for betterment of public works programs through research on managerial problems of organization, administration and personnel staffing. It promotes integrated growth planning under comprehensive management controls and has definite suggestions for easing top administrative staffing burdens that bear so heavily upon public works managers.

J. H. EUSTON
Vice President,
Business Research Corporation
Management Consultants,
Chicago, Illinois

THE DEMANDS now made on Public Works Departments are unprecedented. The reasons are: A growing population and a rapidly shifting population; tremendous vacation migrations; demands for more water, more roads, more public services of all kinds. The public works departments of counties and cities face these demands, often with depleted administrative and technical staffs and inadequate salary scales. Counterbalancing these difficulties in part are new methods of labor-saving in engineering, construction, and paper work processing. And in the background are research facilities that can help public works departments get their work done with more satisfaction to the public and at less cost.

An important key to improving a public works program is the administrative machinery — the systems with which the Executive guides his operations toward a goal. The personnel, equipment, and plant usually are the best that can be assembled at the time. Money has been set aside to pay for the work. What remains as the necessary means for getting things done are the directive will of the executive and his system of management. The system of management is the sole means of bringing the plans, schedules, and standards; the personnel and physical equipment into harness to pull together effectively. Balance and harmony among the mechanical elements and understanding and good will among the personal elements of the administrative system will do the job best. These can be gained by research.

Whereas it can be said that physical and engineering research are practiced popularly in public works, less is understood about organization planning, staff development, management controls, and growth planning. These subjects will now be discussed.

County and city public works departments work with programs de-

signed to satisfy the ever-growing public requirements for services and facilities. Understanding and implementing a program in time implies that everything else is predetermined in time—that is, all requirements are predetermined for: 1, The organization, its nature and scope; 2, the personnel staff, its quality and number; 3, the funds, their source and application; 4, the engineering and operating standards; 5, the materials, their source, quality, and availability; 6, the plant and equipment for construction and maintenance; and 7, the methods: engineering, operating, and administrative.

Planning Ahead. If a county or municipality has problems of an emergency nature—and it usually does—why bother about planning for growth now? The big reason is that it will save executive time and permit managers to manage affairs rather than cope with crises. Planning for growth will reduce uncertainties, foster concentration on essentials and reduce fruitless work.

Growth planning is based on the concept that the entire complex of activities is a "Process." A process has inputs and outputs. It has means of controlling them and maintaining a balanced rate of flow by means of the feed back principle. Each step of a process is predetermined in its design. Once the output is determined in time all the inputs are also determined by kind, where they are to enter the process, when they are to enter, and what the rate of input is to be.

So a public works program can be planned for growth—as a process. Programming of the proper and timely "inputs" of money, personnel, and materials according to the appropriate engineering and business standards and methods will accomplish the desired facility as the necessary and desired "output."

This is not an academic concept. It is a very practical idea for reducing difficulties and crises in management and frustrations in staff and criticisms from the public. One reason why it is so practical now is that means are available through electronic data processing systems to do this planning quickly, completely, and as often as necessary to adjust for changing conditions.

Redesign Engineering and Technical Positions

An organization plan is a design. It shows how functions of the organization are grouped and related

(*Continued on page* 194)

ROADSIDE WEED CONTROL WITH ROTARY CUTTERS

L. J. SILER,
Engineer of Maintenance,
State Highway Commission of Kansas

THE MAINTENANCE department of the State Highway Commission of Kansas has been experimenting with rotary cutters since 1951 thinking that perhaps mowing machine repair costs, which are high on sickle bar mowers used along State Highways, could be reduced.

The first cutters used were mounted on the rear of a tractor and raised and lowered by the hydraulic controls on the tractor. In these, the entire weight of the cutter is carried by the tractor. The cutter had one rotor and cut a five-foot swath which means that the machine has to be five feet in length behind the tractor plus the necessary space for the controls. These machines do a good job of mowing on flat terrain but on right-of-way with steep slopes and narrow ditches there are problems.

Trailer type cutters were also experimented with. These are trailed behind the tractor, being equipped with either toggle wheels behind or rigid wheels on the side of the cutter. These machines do very well on even terrain but the cutter cannot be raised high enough to pass over abrupt raises such as entrances. This causes the cutter to dig and scalp, dulling and even damaging the cutting edges. The trailer type cutter also lacks maneuverability in cutting around signs, posts, culverts, etc., where backing is required.

The third type of machine now being tried has the cutter mounted amidship under the tractor. A higher framed tractor with usually larger diameter wheels is required and a little heavier tractor with more power was specified than was used with the rear mounted and trailer types. Power steering was also specified which we believe is justified, as with power steering the machine can be operated on much steeper slopes than with manual steering. The cutters are well guarded from throwing debris by hanging chains around the bottom of the cutters. Live action or independent type power take-off, so that the cutter can be operated independently of the tractor, is essential and was specified.

A minimum of 30 hp was specified for the 60 to 66-in. undermounted cutter and 42 hp for the 90-in. machine. The 60 to 66-in. machines have two rotors and the larger machines have three rotors, allowing the cutter frame to be considerably narrower than the one rotor cutter.

While there have been some problems, such as a tendency to plug up in higher grass and leaving some uncut areas between cutters, these machines appear to have possibilities in efficient and economical mowing. In the drouth areas in the western part of the state there was some objection from the operators to dust generated by the mower almost directly beneath them. This, however, is not a general problem.

There are considerable variations in our cost records on all types of mowers including the sickle bar types due to age, accidental striking of hidden stumps, rocks, depressions and debris, but it is believed that the rotary type cutters will prove more economical than the sickle type mowers due to less down time and a generally faster cutting speed. The rotary type cutter also leaves a more pleasing appearance as the cuttings are fine and evenly distributed. There is probably also some value from the mulching effect of cuttings in helping to prevent erosion.

Rotary type machines are especially useful in shoulder mowing as the tractor can be operated entirely off of the traveled way which is not usually possible with the sickle bar mower. Rotary mowers will cut fairly high growth; however, a second pass is sometimes necessary where this is excessively high. Also, they are better suited for wide even areas and for interchanges close to population centers that are mowed frequently.

A very important necessity on all rotary mowers is the complete guarding against throwing debris. Rocks, tin cans, bits of wire or glass can be thrown with great force from these cutters if they are not completely shielded and this, of course, cannot be tolerated in highway mowing with vehicles constantly passing.

The department now has something over one hundred rotary cutters.

● **CENTER mounted rotary cutter showing chain guards to prevent throwing debris. This machine has power steering.**

● **TRAILER type mower, equipped wtih rear toggle wheels, gives good performance on even terrain, as smooth shoulders.**

THE CASE FOR SUBMERSIBLE PUMPS for DEEP WELLS

ROGER BARRON,
Byron Jackson Division,
Borg-Warner Corp.

PERHAPS it is best to fill in some of the background concerning the submersible before getting down to cases. Some may feel that this type of equipment is comparatively new; others may know or realize only vaguely what it is. Probably few fully realize that a pump and electric motor combination that would work beneath water was successfully designed as early as 1908 and that wide usage was achieved during the first World War.

It was logical to the early designers that the most efficient arrangement for a pump and driver was to locate them as close together as possible. As such, the first patents were taken out on a motor that would operate when completely submerged under water. The windings of this motor were sealed off from the water by insulation on the motor windings themselves. This motor was large and bulky; it was, however, an important milestone in a new era.

Little was done in the submersible pump field until the 1920's when two new designs were patented—an oil filled motor and another type of wet or water filled motor. In the water filled motor the windings of the motor were sealed off from the well water by a stainless steel sleeve between the rotor and stator. These basic designs are still used.

To give an idea as to how the submersible pump is being accepted, over 60,000 units were sold in the past year. The majority of these units were the small domestic type; however, it is indicative of the acceptance of the submersible idea.

Almost every town or community today has at least one problem in common with all others: acquiring an adequate and dependable water supply for increased populations, new appliances and new modes of living.

The search for adequate and dependable water supplies has led to ever increasing depths of pump settings. With the submersible, water can be pumped from any depth, efficiently and economically. Today submersibles are pumping water from depths as great as 1450 ft. below the surface. Since there is no long shaft, a submersible operates quietly and smoothly in all cases. This is particularly true in the case of the crooked well. As long as there is sufficient room to install the submersible, the well need not be abandoned.

So far, discussion has been restricted to the deeper settings. However, submersibles are equally advantageous in the shallower settings. The ever-widening search for adequate and dependable water supplies has led to the location of wells in residential neighborhoods. When the conventional pump is used, we are faced with two major problems at the outset. First, and most important, is that of noise. With the submersible there is no noise problem. A 300-hp submersible motor and pump running at full capacity make no noise. The second major problem is that of a pump house that will blend with the surrounding area. The cost of these pump houses may exceed the cost of both well and pump. With the submersible pump, this cost can be almost completely eliminated.

The search for adequate and dependable water supplies has led to the development of wells on or near a river bank or a flood plain. The submersible motor pump answers the problem of potential damage from flood.

● **PUMP and submersible motor are coupled together and are about to be lowered into a deep well at Casa Grande, Ariz., which is expected to yield up to 3700 gpm.**

● **SUBMERSIBLE motor is being checked and inspected before attachment of the pump and lowering into place in well.**

● **WATER starts to come up as the submersible is put in operation. BJ installation rig is shown in the background.**

The problem of surface water contamination of the well from the flood waters is completely eliminated through a water tight seal that can be used in conjunction with the submersible pump. This flood-proof feature has led, naturally, to another use for submersible motor pumps, that of river intake work. Not only are the expensive structures commonly associated with river intake stations eliminated, but maintenance costs from pump bearing wear have been reduced or virtually eliminated. These maintenance costs are brought about by silty river water that exists in virtually every surface stream. Submersible river intake pumps are available that do not have a single pump bearing exposed to the pumped liquid. All bearings are contained within the submersible motor where they operate under controlled conditions. It can be readily seen how pump life can be increased from such an arrangement.

Another use for submersible pumps is that of booster service. A submersible booster pump is simply a conventional submersible pump and motor set into a receiver or barrel. Existing main pressures are discharged into this completely sealed barrel. The submersible pump picks up this main pressure and discharges at the desired increased pressures. Such a submersible booster station occupies very little space. This means we could locate it beneath the street, sidewalk or any other city owned property. Savings in construction and real estate costs could be quite large. A further advantage is that the station can be made completely automatic requiring no attendants; and, most important, it can be situated wherever the booster is required.

Another major advantage of the submersible motor pump is the elimination of routine maintenance on any application whether it be booster service, deep well service or river intake work. This means lower operating costs to the municipality or the owners of the equipment.

It should be remembered that despite all these advantages the submersible is not a panacea for all pumping applications and it should be selected with care. Things to be remembered in this selection are: (1) Exactly what is desired of the unit?; (2) Into what sort of conditions will it be installed?

The proper step is to contact an engineer or manufacturer who has had experience in the submersible field. Outline to him exactly what is to be done and profit by his experiences in getting a sound and trouble-free job.

● **BOWL assembly is being lowered onto the motor. Monroe Smith, installer is also shown in pictures above.**

Salt Brine Well Cuts Road Treatment Costs

Salt brine pumped from an abandoned wildcat oil well permits the Jackson County, Mich., Road Commission to maintain its gravel roads at approximately one-sixth of the previous cost. County road workers treat 800 miles of gravel highways with the brine.

The Commission purchased the rights to the abandoned well and discovered the brine contained about half calcium chloride and half sodium chloride, with a slight trace of magnesium chloride. The board uses the brine in 20-25 percent strength to stabilize gravel roads in the county. To date, 1¾ million gallons have been used. The county highways include 800 miles of gravel roads and 600 miles of blacktop and concrete roads. Estimated cost of the salt brine is $4.00 per ton spread on the road.

The commission installed a Deming deep well turbine pump on the well and raised the discharge pipe high enough to fill county trucks. A 5,000-gallon truck drives under the loading line and the operator opens the valve and, in a few minutes, the tanker is pumped full.

Besides regular treatment of gravel roads, the county also sprays the brine on gravel storage piles to prevent freezing during winter. Under certain weather conditions the salt brine is also used to remove ice from some county highways.

RURAL DIRECTORIES FOR COUNTIES

IN McLENNAN County, Texas, every rural home will be designated by a street number which will show where it is and how far it is from the county Court House at Waco. The rural directory will contain names, house and mailing addresses and telephone numbers of persons who live in the County outside of the incorporated towns.

The McLennan County Court House is the center of this numbering system. All house numbers indicate the distance from the Court House to the house. The first two digits of a three-digit house number indicate the number of miles from the Court House to the nearest tenth of a mile. For example: house number 642 indicates a distance of approximately 6.4 miles from the Court House. The "2" being an even number shows the house is on the north or east side of the road. Last digit even numbers always indicate the north or east side of the road. Last digit odd numbers always indicate the south or west side of the road.

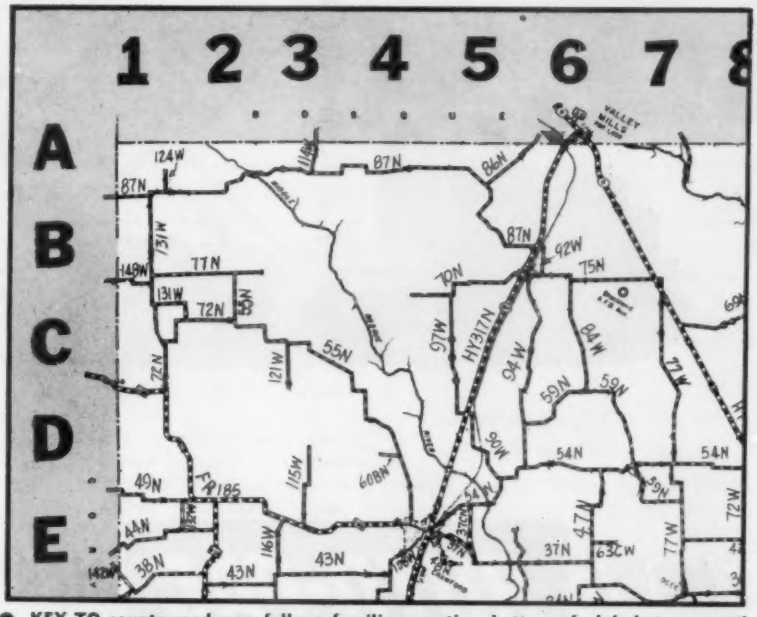
The first three digits of a four-digit house number also indicate the number of miles from the Court House. For example: house number 2347 indicates the house is 23.4 miles from the Court House. The 7 being an odd number indicates it is on the south or west side of the road. An asterisk in front of the name indicates a home owner.

This system applies throughout the County except in those rather isolated cases where the Waco numbering system extends beyond the city limits.

County Road Designation

A key to the County road map that appears on the first page of the directory locates any county road, following the familiar map location procedure. Letters of the alphabet run vertically and numbers run horizontally. For example: to find Road 42N which the key shows to be at E8, the band "E" is followed down from the top of the map and the band "8" across. The intersection shows the desired road.

The directory is divided into 4 major departments. The first is an alphabetical listing of the names of County residents and business concerns; the second is arranged by road and house number with named roads first, numbered roads second, and smaller towns third; the third section classifies farmers according to the type farming in which they specialize; and the fourth is the classified Buyers' Guide. Code road sign markers are to be installed at the intersections of county roads. The road markers will use numbers and letters for indicating directions, N, S, E, W. These markers are enameled metal signs, 12-inch x 6-inch, with reflective lettering, mounted on a 6-foot high angle iron post.



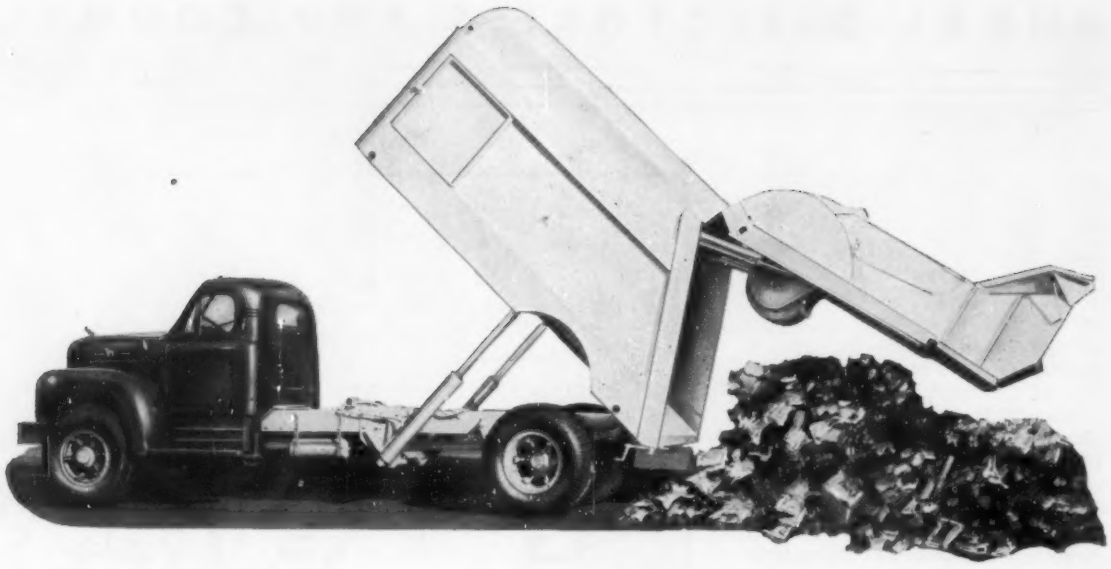
● **KEY TO** county road map follows familiar practice. Letters of alphabet run vertically and numbers run horizontally. These indicate road numbers as shown in text.

● **CODE** road sign markers are installed at all highway intersections.

● **HOUSE** number indicates distance is 19.8 mi. from County Court House.

The material in the directory is gathered by house to house canvass with special care to give it maximum accuracy. Each year the house-to-house canvass is again made so that the annual revised edition will include all changes in the county rural residences.

The county engineer of McLennan County is Manton Hannah. The directory was prepared by Rural Directory Service of Central Texas, Austin, Texas. Directories are furnished free to every rural resident of the county.



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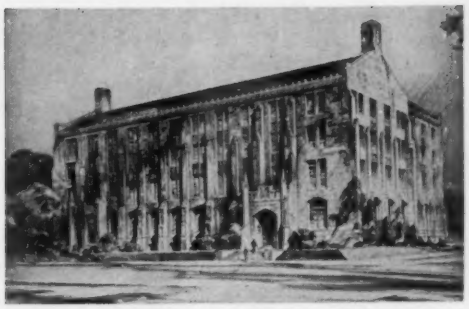

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Galloway Honored at Spring Meeting of N.Y.-N.J. Chapter

Englewood, New Jersey — More than 300 members and guests were in attendance at the annual Spring meeting of the New York-New Jersey Metropolitan Chapter held in Englewood, on May 22nd. The Chapter honored Fred M. Galloway, who recently retired from the position of General Superintendent of the Montclair, New Jersey, Department of Public Works by presenting him with its 1957 Award of Merit for the many contributions he has made in helping to organize and develop the New York-New Jersey Chapter. The presentation was made at the dinner meeting which was held at the Casa Mana Club in nearby Teaneck, New Jersey. Chapter President, Harold Fredericks, Town Engineer of Irvington, presided at the dinner meeting and introduced the guests in attendance which included Robert L. Anderson, Superintendent of Public Works, Winnetka, Illinois and Sol Ellenson, Director of Public Works, Newport News, Va., President and Vice President, respectively, of the American Public Works Association.

The all-day program was built around a large display of public works equipment which covered a sizeable portion of Mackay Park. Elmer A. E. Blackwell, City Engineer of Englewood was chairman of the meeting which included a complimentary luncheon at the Elks Club, several informative discussions and an inspection trip of the Bergen County Sanitary Landfill. John Zemlansky, Principal Sanitarian of the New Jersey State Department of Health and E. Merrill Seaberg, Director of Public Works of Bergen County discussed the subject of refuse disposal, in general, and the sanitary landfill method in particular while Ed Brarmann, Englewood's Park and Shade Tree Superintendent gave an illustrated talk on the planting and care of street trees.

Columbus Engineer Elected President of Ohio Chapter

Springfield, Ohio—Public works officials recently gathered at the Clark County Fairground in Springfield for the annual meeting of the Ohio Chapter of the APWA. One of the highlights of the meeting was the election of officers which placed Robert Werner, Chief Engineer of Columbus, as the head of the Ohio Chapter. Fred M. Hughes, Superintendent of Public Works of Springfield was elected Vice President and C.A. Boeke, Director of Public Service of Middletown was re-elected Secretary-Treasurer of the Chapter.

● **MEMBERS and guests attending the annual meeting of the Ohio Chapter of the APWA, held at Springfield, Ohio.**

OFFICERS: Robert Anderson, Winnetka, Ill., *President;* Sol Ellenson, Newport News, Virginia, *Vice President.* REGIONAL DIRECTORS: (three year terms) Albert G. Wyler, New Orleans, La.; Wm. D. Hurst, Winnipeg, Manitoba, Canada; Frederick Crane, Buffalo, N. Y.; (two year terms) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (one year terms) K. K. King, Phoenix, Arizona; Charles W. Cooke, Hartford, Conn.; R. V. Moschell, Alcoa, Tennessee. *Immediate Past President,* Edward P. Decher, Newark, N. J. Donald F. Herrick, *Executive Director.*

Others named to the Executive Committee were: William C. Wichman, Director of Public Works, Cincinnati; William J. Gross, Director of Public Works, Toledo; and Louis Drasler, Director of Public Service of Cleveland.

Mayor Harry Strachan of Springfield welcomed the delegates to the Host City. The program featured talks on "Basic Elements of Municipal Construction Contracts" by William Gille, Assistant City Attorney, Columbus; "Regulation of Utility Cuts In City Streets" by William Gross of Toledo; and "Current Federal and State Highway Programs as Applied to Urban Areas" by Howard Craig, Engineer of Construction for the Ohio Highway Department. Robert L. Anderson, President of the American Public Works Association of Winnetka, Illinois was the guest speaker at the noon luncheon. The latter portion of the one-day program was devoted to the review of exhibits and an inspection trip of public works projects.

Alabama Chapter Holds Annual Meeting in Tuscaloosa

Tuscaloosa, Alabama — The annual meeting of the Alabama Chapter was held at the Stafford Hotel in Tuscaloosa, May 9 and 10. The banquet featured an address of welcome by George Van Tassell, Mayor of Tuscaloosa and an interesting talk on "Local Government' by Judge George Wallace of Clayton. Chapter President F. E. Erwin, Mayor of Tarrant, Alabama presided at the meeting.

Other highlights of the program were talks by R. V. Hawkins, City Engineer, Tuscaloosa, on "Engineering In Connection With Public Works"; Sanitary Engineer R. C. Barton, Jr., who spoke on "The Jefferson County Sewerage System"; and Commissioner J. T. Waggoner, who discussed "Birmingham's Low Cost Paving Program."

Neal McRae, Superintendent of Streets and Sanitation of Birmingham was elected President of the Chapter at the business meeting. A. C. Parker, Consulting Engineer of Tuscaloosa was named Vice President and Joe Dunn of Birmingham was re-elected to the post of Secretary-Treasurer of the Chapter. Other members of the Chapter's Executive Committee are: F. E. Erwin, Mayor, Tarrant; V. H. Albright, Mayor, Haleyville; Oliver Wright, Superintendent of Street Maintenance, Montgomery; Robert V. Hawkins, City Engineer, Tuscaloosa, and Wilson W. Hill, Superintendent of Public Works of Auburn. The meeting also included an equipment exhibit and a barbecue which was enjoyed by the delegates and their wives who were in attendance.

Michigan Members Hold Public Works Conference in Lansing

Lansing, Michigan—Approximately 70 members and guests attended the 1957 Michigan Public Works Conference at the new Civic Center in Lansing on May 16. The afternoon session featured a talk on aerial photography by John C. Bayless, Sales Manager of Abrams Aerial Survey Corporation, and a panel discussion on "Equipment Management and Cost Accounting." Harry Modoff, President of the Telford Equipment Company of Detroit was moderator of the panel discussion. Participants included Robert McIntosh, Director of Public Works, Battle Creek; Robert McNutt, City Manager, Harper Woods; and Fred Mammel, Assistant City Engineer, Ann Arbor. This discussion was followed by the showing of two interesting movies on safe road construction practices and the building of the St. Lawrence Seaway.

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THE CAULKING gave way at a joint in a 16-inch water main in Beach Haven, N.J. Pressure exerted by a 100,000 gallon water tower only 50 feet away quickly opened up the break.

Loss of water and further damage to the main had to be halted immediately. The task was labeled "emergency."

The Beach Haven Water Department rushed its Henry Earthmovers into action.

Ground Is Frozen

"The ground was frozen," operator Bob Giberson reports, "and the water turned much of the earth into mud."

But the Henry Backhoe dug a trench 6 feet deep by 5 feet wide—in "20 minutes."

The leak was repaired. After which, Bob swung his tractor around and backfilled the trench with his Henry Industrial Tractor Shovel.

16 Hours Work in 20 Minutes!

Both the operator and assistant superintendent Harry Marshall agreed that, with former methods using manual labor, it would have taken three men 16 hours to dig that excavation.

Metal sheets would have been driven into the ground manually to prevent a cave-in. Bob used his Henry Backhoe to drive in the metal sheets in minutes.

No Breakdowns in 2 Years

These men have found that it takes three men 8 to 10 days to dig a trench 250 feet long, under normal conditions. Digging time with a Henry combination: 8 hours.

In fact, this Henry operator says, "Running steadily, I can dig 275 feet in 8 hours."

Of Henry maintenance, he reports: "No breakdowns. Only the usual servicing, greasing, checking—in 2 years use."

Henry Surprises Him

In addition to trenching, this Water Department uses its Henry equipment to load trucks with gravel, taking only 6 to 7 minutes to load a 6 to 8 yard truck.

They recently used the Henry Tractor Shovel to erect a 26-foot telephone pole weighing at least 800 lbs. The Henry picked up the pole and dropped one end into the hole. The surprised superintendent says, "I didn't think any loader the size of the Henry could perform a feat like that!"

And the operator, Bob Giberson, whose fast work in this emergency won him praise, says, "The Henry Backhoe and Tractor Shovel are the best as far as I am concerned. It's such an easy rig to operate. I can go on and on operating it without getting tired."

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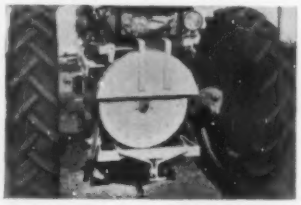

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The Michigan Asphalt Paving Association, Telford Equipment Company and Eddy and Company were co-sponsors of the Reception which preceded the banquet. Chapter President, H. M. Hultquist, Managing Director of the Concrete Pipe Association of Michigan presided at the dinner meeting which featured a very entertaining talk by Prof. Charles Smith of Western Michigan University. The ladies in attendance also enjoyed an excellent program which was arranged by Mrs. Robert M. Bruce, wife of the City Engineer of East Lansing.

California Chapters Hold Joint Meeting at Disneyland Hotel

Anaheim, California—The Southern California Chapter and the San Diego-Imperial County Chapter of the APWA held a Joint Meeting at the Disneyland Hotel in Anaheim on Thursday, May 9. The program included several informative talks. The first was by Clarence Allen, Assistant Professor of Geology, California Institute of Technology on "Southern California Earthquake Faults, History of Movement, and Future Expectancy." The second speaker on the afternoon program was Lin S. Hollinger, Assistant Chief Administrative Officer for Los Angeles County, who spoke on "Budget Acceptance."

The evening portion of the program included a reception and a dinner meeting which featured a talk by John A. Lambie, County Engineer for Los Angeles County whose subject was "Field Observations on Ground Movement—Portuguese Bend, Palos Verdes."

North Dakota Chapter Holds Meeting at State University

Grand Forks, North Dakota—The first meeting of the North Dakota Chapter since it was organized last fall was held at the Union Building on the campus of the University of North Dakota on April 12. F. C. Bundlie, President of the Grand Forks City Council welcomed the delegates to the City and stressed the importance of the work of public works officials in the solution of many of the problems created by the rapid expansion of cities and towns all over the country.

Chapter President Edward J. Booth, City Engineer of Bismarck presided at the meeting which covered a wide variety of topics, including refuse collection and disposal, street maintenance, and the design, construction, and maintenance of utilities. APWA Regional Director, W. D. Hurst, who is the City Engineer of Winnipeg, Manitoba, was guest speaker at the meeting and discussed the growth and development of the Association and the services it provides to answer the needs of its members.

The transfer of the Chapter's Secretary-Treasurer to another position resulted in the election of Vernon Fahy, Director of Public Works of Minot to fill this office. The interest shown in this first meeting clearly indicates that the North Dakota Chapter will soon become one of the more active in the Association.

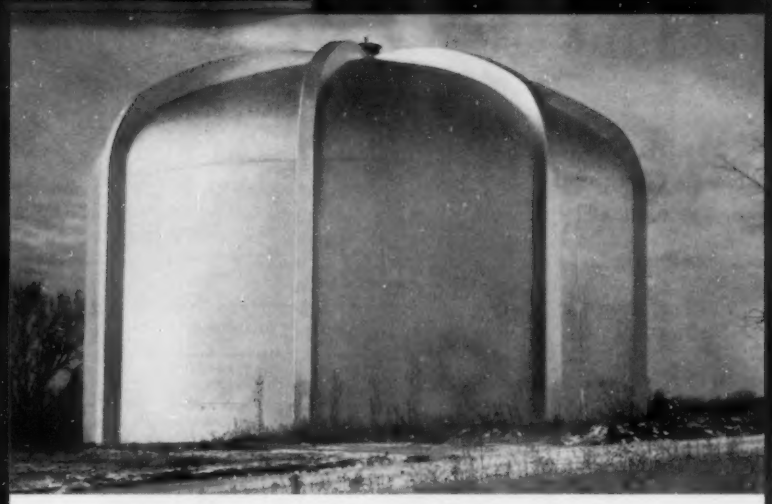
Stallings Elected President of Tennessee Chapter of APWA

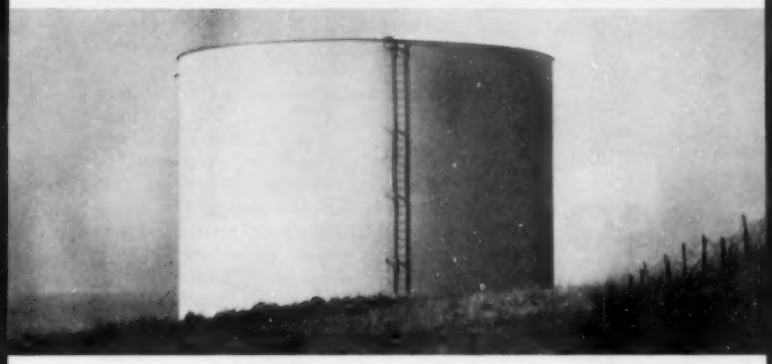
Chattanooga, Tennessee—Karl Stallings, Director of Public Works of Nashville was elected President of the Tennessee Chapter of the APWA at a meeting held in Chattanooga on Tuesday, May 7, in conjunction with the Annual Convention of the Tennessee Municipal League. Mr. Stallings succeeds Robert Moschell, City Engineer of Alcoa who is also a Regional Director of the APWA. Charles K. Marsh, Assistant City Manager of Kingsport was named Vice President and Murphy Snoderly, Public Works Consultant for the Municipal Technical Advisory Service of the University of Tennessee in Knoxville was re-elected Secretary-Treasurer of the Chapter.

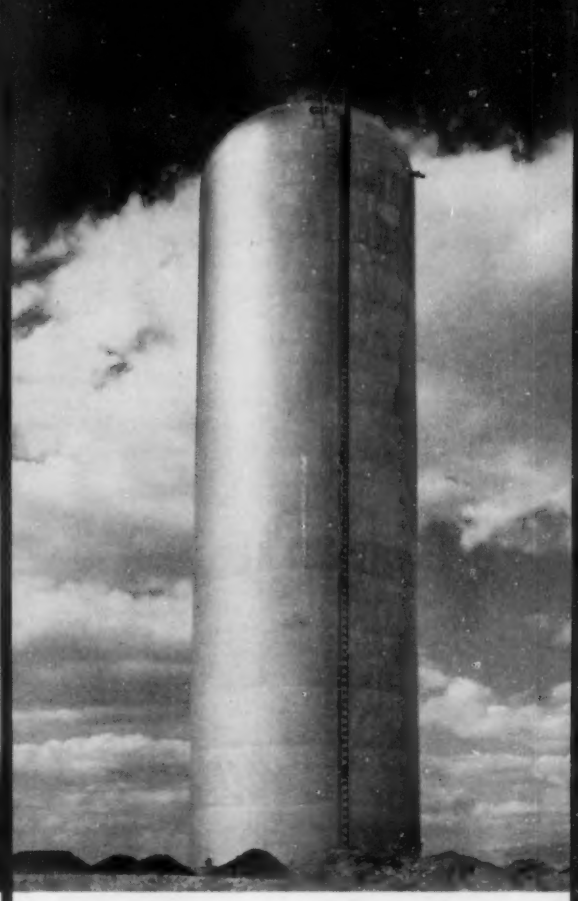
The program featured a guided tour of public works facilities in that area by Bernard F. Barnes, City Engineer of Chattanooga; a talk by J. Gilbert Stein, President of the Chattanooga Chamber of Commerce; and a five-part discussion on how 500 new workers would affect the public works activities of a community. Participating in this discussion were: George Jackson, City Engineer, Maryville; J. W. Arbuckle, Recorder, Lewisburg; G. M. Conn, City Commissioner, Bristol; Morgan Watkins, Utility Engineer, Athens; and C. N. Smotherman, Building Inspector, Murfreesboro.

Konefes Re-elected President of Chicago Metropolitan Chapter

Chicago, Illinois—The Chevy Chase Country Club was the site of the Annual Spring Meeting of the Chicago Metropolitan Chapter of the APWA. The golfers were forced to detour to some dryer greens in the area, but the damp weather had little effect on the dinner meeting which was very well attended. The Chapter membership expressed its approval of the present officers by re-electing the entire slate for an-







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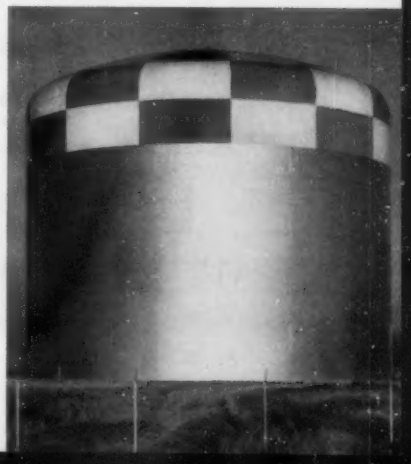

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other term. They are: Al Konefes, Superintendent, Bureau of Equipment Service, Chicago, President; William Smaha, Administrative Assistant, Brookfield, First Vice President; Armon Lund, Superintendent of Public Works, Wilmette, Second Vice President; and Charles V. Sramek, Ward Superintendent, Chicago, Secretary-Treasurer.

A follow-up portion of the Spring Meeting was held on Tuesday, June 4, when 100 members and guests enjoyed an all-day boat trip inspecting the new harbor facilities being constructed in the Lake Calumet Region of Chicago.

Wisconsin Chapter Establishes Awards for Engineering Students

La Crosse, Wisconsin—The Wisconsin members of the APWA held their annual meeting in La Crosse on Thursday and Friday, May 16 and 17. Several important actions were taken at the business meeting which was presided over by Chapter President Wayne Bryan, Director of Public Works of Neenah. Two $100 Awards were established which are to be given to engineering students in their Junior year who are interested in the field of public works. Details are to be worked out at a later date but the action taken provides that one of the awards will annually be presented to a student at the University of Wisconsin and the other to a student at Milwaukee University. The Chapter also voted to contribute the sum of $150 to the APWA Research Foundation.

F. D. Kuckuck, Director of Public Service of Wauwatosa, was elected President of the Chapter while the Vice President's post went to R. E. Fleischer, Director of Public Works of Sheboygan. John G. Thompson, City Engineer of Madison was re-elected Secretary-Treasurer. Edwin J. Duszynski, Director of Public Works of Appleton and Ivan Van Akkeren, City Engineer of Oshkosh were elected to serve on the Executive Committee.

The program included an address of welcome by Mayor Milo G. Knutson and a luncheon talk by APWA President Robert L. Anderson of Winnetka, Illinois. This was followed by an interesting discussion on "Public Relations" with Mr. Kuckuck presiding. Panel participants included: Joe Lustig, City Manager, Janesville; Nathan J. Sindelar, Director of Finance, Eau Claire; and C. T. Henry, Village Manager, Shorewood. A general discussion on "Employee Selection and Training" with James A. Brophy, Street Commissioner of Madison presiding and a boat ride on the Mississippi River rounded out the program.

Upstate New York Members Hear State Director of Public Works

Buffalo, New York—Approximately 80 members and guests attended the Spring Meeting of the UpState New York Chapter in Buffalo on May 12-24. The meeting included a special program for the ladies. Sportscaster Jimmie Thompson for Buffalo Station WJJL was Master of Ceremonies at the Banquet which featured a talk by John E. Johnson of Albany who is Director of the New York State Department of Public Works.

Other speakers on the action-packed program were: Steven Pankow, Mayor of Buffalo; Martin W. Oettershagen, Deputy Administrator, St. Lawrence Seaway Development Corporation; Col. Loren W. Olmstead, U. S. Army Corps of Engineers; Frederick W. Crane, General Manager, Buffalo Sewer Authority and APWA Regional Director; and John C. Quinlan, Chief Inspector, Smoke Abatement Division of Buffalo. The program also included an Equipment Show at the Marine Airport, a bus tour of the Buffalo Skyway and Sewage and Incinerator

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DANCO ROTARY MOWERS ARE NOW BEING USED FOR HIGHWAY MAINTENANCE BY KANSAS, TEXAS, IOWA, INDIANA, NEBRASKA, TENN., MICHIGAN, WISCONSIN, ETC., AND BY COUNTIES, MUNICIPALITIES, TURNPIKE AUTHORITIES, AIRPORTS, AND GOVERNMENT INSTALLATIONS.

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September 24, 1956

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Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Dear Sir:

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It steps up our brush removal program. It consolidates the bulk, thereby lessening dumping operations. It requires minimum maintenance and manpower.

During the 1955 hurricanes and floods, we found it especially beneficial in disposing of branches and limbs of trees, thus speeding up the opening of the highways.

Very truly yours,

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Edmund V. Carlos, Supt.
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c.c. Mr. Edgar E. Maynard,
Road Maintenance Engineer.

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Your City will find that the Fitchburg Wood Chipper is money-saving equipment in your Highway or Park Departments. Tree trimmings are quickly reduced into load-saving wood chips. Fewer loads cut your loading and hauling expenses. Brush removal becomes a faster, simpler, less expensive operation.

Fitchburg Wood Chippers are engineered to stand hard use, to give long service without excessive maintenance costs. There is only one Wood Chipper on the market today with a One Year Guarantee...The Fitchburg Wood Chipper.

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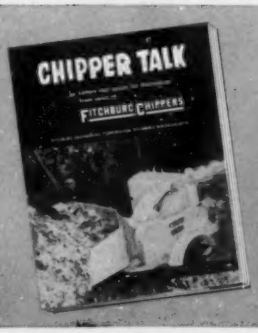

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Plants and a trip around Buffalo Harbor on a Coast Guard Cutter.

Chapter President John A. Ulinski, Director of the Niagara Frontier Port Authority presided at the Business Meeting which included the election of a new slate of officers. Arvid R. Karkainen, Construction Engineer of Rochester's Department of Public Works was elected President of the Chapter, while his coworker, Kenneth Miller, Assistant Engineer of the same city was named Secretary-Treasurer. Joseph F. Hayden, Commissioner of Public Works, Troy was made Vice Pres.

Batch Design, Control and Field Practice for

LIGHTWEIGHT CONCRETE

TRUMAN R. JONES, JR.
and
HENSON K. STEPHENSON

Presented at the American Concrete Institute, 53rd Annual Convention, Dallas, Texas, February, 1957

THERE ARE certain characteristics peculiar to lightweight aggregates and lightweight aggregate concrete that are not found in the more common heavy materials. When the lightweight materials are handled in the conventional way, unnecessary problems are created in batch design, handling, placing and finishing that detract from the quality of the finished product and discourage the use of the material.

There are several characteristics peculiar to lightweight aggregates that require special consideration. (1) The aggregates are sharp and angular throughout the range of sizes, even the particles passing a 200-mesh sieve, and this tends to make the concrete harsh and unworkable just as crushed rock makes a concrete more harsh than sand and gravel. (2) The fines have a higher unit dry weight than the coarse aggregate and the method of manufacture produces an extremely dry material; both factors combine to make a product that segregates badly if not counteracted. (3) The aggregates are highly absorptive and the rate of absorption is variable making it impractical to use specific gravity values in batch design computations and creating a problem in maintaining uniform workability on the job. (4) The aggregates are lighter than the concrete in which they are used, causing the coarse aggregate to float to the surface when improperly handled. (5) The light weight of the concrete increases the tendency that concrete normally has to entrap air and form honeycomb.

The suggestions and conclusions that follow are based upon observations of laboratory tests using three expanded shales and one expanded clay from different Texas producers; field uses on several major structures; and plant uses of several concrete products manufacturers. It is believed that the suggestions and conclusions will apply in a qualitative way to the use of all uncoated expanded clay, shale, and slate aggregates.

1. The mix design should be set up with the aggregates on a dry, loose volume basis and the proportions can best be determined by trial batches.

2. The basic mix design can be converted to weights for batching in the field.

3. A much higher percentage of fines is required than for conventional sand and gravel concrete.

4. A neutralized vinsol resin should be used to entrain sufficient

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John Keelor, head of Keelor Construction Co., going over job blueprints with G. L. Finnen, Resident Engineer, and E. R. Hummell, District Construction Engineer.

"I've used all the popular makes of steel forms in my years in the construction business and I find the **Extra Quality** built into Heltzel Forms means **Extra Profits** right down the line," says John Keelor, head of the Keelor Construction Company, Pennsburg, Pa., one of the east's leading construction firms.

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air for good workability; this appears to be from 4 to 7 percent.

5. The aggregate should be prewetted before handling or shipping to prevent segregation and should be prewetted at least 24 hours before batching to help control the absorption and give a uniformly workable mix. The water content of the aggregate should be uniform for any given pour.

6. Special care should be taken to assure thorough mixing. The mixing time is longer than that commonly used for sand and gravel concrete and the speed of the mixer should be faster.

7. The mixing water content in the field can be maintained at a constant level by checking the consistency of the concrete with the slump cone test. Constant values of slump indicate constant values of free mixing water for a specific batch design.

8. Expanded shale and clay concrete can be placed and finished with approximately 2-in. less slump than is required for a given situation using sand and gravel.

9. Vibration is a necessary requirement for good work. Frequencies in the neighborhood of 7200 rpm give excellent results; this is approximately twice the frequency most commonly used for sand and gravel concrete.

10. Flat surfaces will usually require the use of a "jitterbug" or high frequency vibrating screed to maintain sufficient fines on the surface for finishing. Floating and troweling should be kept to the minimum necessary for a smooth surface.

11. Forms can be designed for much lighter loads.

• • •

English Data on Revenue from Refuse

Assuming an average yield of refuse, under English conditions, of 1550 pounds per 1,000 persons per day, substantial revenues from salvage of certain materials is indicated. In a paper by S. Cayton, Chief Public Health Inspector of West Bromwich, England, salvage of paper, metals and textiles was discussed.

Paper recovery is estimated at one ton per thousand population per month, but in many areas this volume is exceeded. The potential yield of metals, including tin cans of all kinds, exceeds 7 tons per thousand population per year. With separation plants, the rate may reach 10 tons, while hand separation may produce as little as 4 tons. In West Bromwich, it is the intention to earn sufficient revenue from refuse to meet the whole cost of disposal. The record for the latest complete year showed a cost of £10,936 against a revenue of £8,815.

Waste paper is collected in the main from business premises by waste paper merchants and from domestic premises by the local authorities. Principal use is in manufacturing packaging board. In West Bromwich, the target is 40 tons per month, with the workmen receiving, as an incentive, 40 percent of the income in excess of the target.

Scrap metal and tin cans are collected from every load of refuse before it goes over the "tip face," and each evening some of the drivers deliver the metal at the salvage depot, where it is baled, along with worn out "dustbins" (refuse cans) which have been replaced by new ones. This method yields 1,000 to 1,200 pounds per day. After deducting 40 percent of the income for the workmen, there is little if any remaining profit.

Textiles include carpets, sacking, woolens and mixed rags. These

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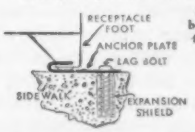

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amount to only a few pounds weight in each ton of refuse, but they are easily recovered, even without mechanical sorting equipment, and can be accumulated without offense. Grading has been found advantageous if the quantity justifies it, since woolens and white rags bring higher prices.

Dual advantages from recovery are the reduction of out-of-pocket expense and conservation of shrinking disposal areas.

• • •

Automatic Filtration Plant Serves Durango

From an article by M. W. Thomas, City Manager of Durango, Colo. in Colorado Municipalities.

WATER FOR DURANGO, Colo., is obtained from the higher levels of the Florida River. In previous years only chlorination was provided, but increasing population density on the watershed resulted in the need for filtration facilities. The new filter plant has a capacity of 8.8 mgd and is operated automatically and by gravity except for wash water facilities, which require use of a pump.

Water from a 75 mg reservoir flows through the chemical building to the rapid-mix basin. The chemical building is a small two-story structure containing a monorail hoist and three chemical feeders. By means of the hoist, chemicals are lifted to the second floor and discharged into the feeder hoppers. Two feeders add aluminum sulphate to the water and a third can feed activated carbon, but this is used only occasionally to combat taste and odor resulting from algae growth that may escape copper sulphate treatment in the reservoir. The water comes from melting snow and does not require softening.

Coagulation and sedimentation takes place in two rectangular basins each 120 feet long and 40 feet wide with a depth varying from 11.5 feet to 8.5 feet. Each basin has approximately 200 feet of overflow weir. Flocculating equipment has been omitted, although room has been provided for its later addition if necessary.

The filter building, a two-story structure approximately 62 feet x 57 feet contains four double bed filters, a chemical room and a combination office and laboratory. Each filter has a rated capacity of 2.2 mgd providing a total capacity of 8.8 mgd.

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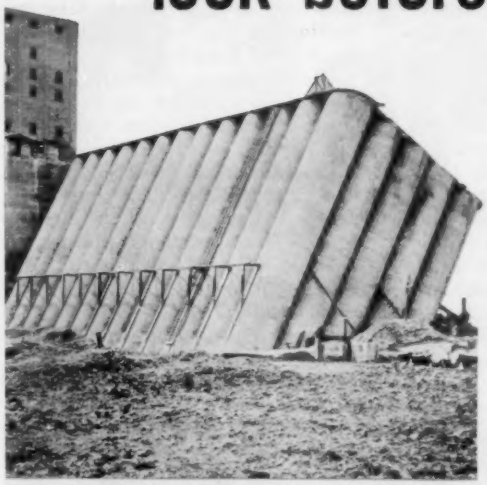

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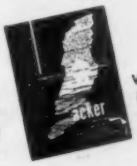

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Leopold Duplex Filter Bottoms are getting more popular every day. And for good reasons, too. They last longer, perform better, and are unequalled in economy. Want more details on this "performance-proved" filter bottom? Write us today. No obligation.

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227 S. Division St. Zelienople, Pa.

All valves in the treatment plant are of the butterfly type. The rate-of-flow controls and the butterfly valves in the pipe gallery are air-operated and are controlled from a panel in the operating gallery.

Filter operation is completely automatic with safety overflow protection. A 24-inch motorized butterfly valve, modulated by a float control in the settling basins, controls the entrance of water from the reservoir. Four 12-inch butterfly valves, also modulated within an adjustable range of water depth on the filter beds, control the amount of water flowing from the sedimentation basins to the filters. Finally, the rate-of-flow controllers, modulated from a bubbler tube extending in the clearwell, control the rate of filtration.

The automatic operation can be more clearly pointed out in reverse order. As consumption diminishes, water in the clearwell rises, thereby gradually throttling the rate-of-flow controllers. This, in turn, causes the water depth to increase on the filters gradually closing the influent valves. As a result, the water will also rise in the settling basins causing the 24-inch influent valve to close, thus reducing the supply coming in from the reservoir. When consumption increases, the reverse takes place and the plant again adjusts itself to the demand. Automatic feeder equipment adds both fluorine and chlorine to the treated water. Filter wash water is pumped from the 250,000-gal. clearwell.

Indicating, recording and totalizing instruments measure the water entering and leaving the plant. A device measuring the discharge over the final weir actuates a chlorinator to provide automatic chlorine dosage in proportion to the flow. Fluorine is also applied in proportion to the flow. A double air supply, standby gasoline power and provision for operating the valves by hand are among the safety and emergency features provided.

• • •

Electronic Sign Warns Drivers Exceeding Speed Limit

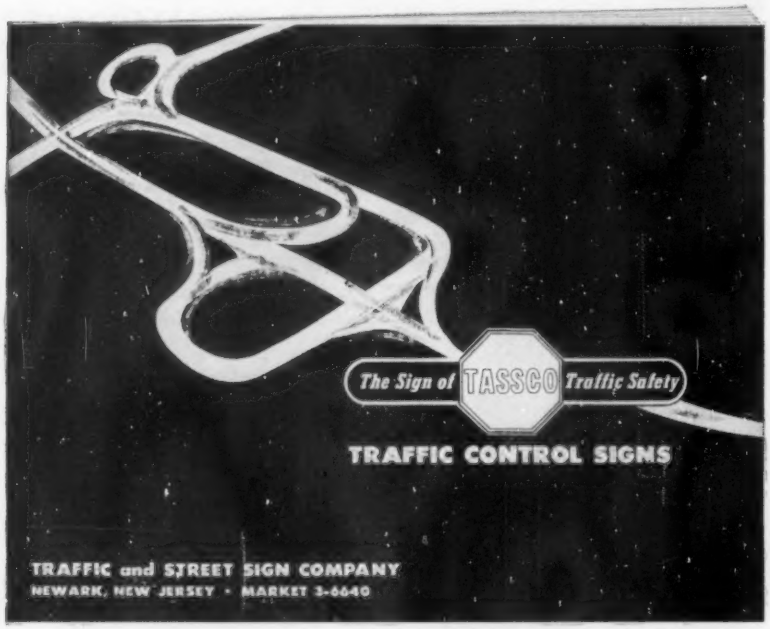
A sign which, by means of a radar wave, computes the speed of an approaching car is being tested at the Portsmouth, N. H., Air Base. When a car approaching the sign is traveling over the speed limit the sign lights up and says "You are speeding."

If the driver fails to heed the warning, the gadget takes a photo of the car, the license number, speed, date and time. Auto club officials have questioned the legality of such a device since a car owner might be arrested for an offense that was committed by a friend who had borrowed the car. Advocates of the speed control sign say that it discourages speeding without the need of patrolmen. The unit costs $300 and can be installed in about twenty minutes, it was reported.

• • •

Rainfall and Runoff Data from Indiana Watersheds

A study of rainfall and runoff on the Upper East Fork of White River, Ind., is reported by the Indiana Water Resources Study Committee. The records cover 25 years. Average rainfall was about 39.5 ins., with a low of 25½ to 27½ ins. and a high of 56 to 58 ins. Runoff coefficients were determined for a 24-year period on an annual basis. These coefficients, based on actual recorded rainfalls and measured stream flow, are for the most part quite consistent for corresponding years. On an average, these coefficients reflect runoff equivalents of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34 percent of rain falling over the East Fork watershed area as compared to 36 percent for the Flat Rock River area. In the lowest runoff year of record, 1941, the runoff equivalent was only 8 percent of the rain that fell on the watershed area as a whole and 10 percent for the Flat Rock River area, as compared to the record year of 1950 when both rainfall and runoff equivalents were 54 percent and 61 percent, respectively.

The average annual runoff per sq. mile for the 18 watershed areas of the state was 220 million gallons with a range from 311 to 175 mg per square mile. The highest watershed yield occurred in the southern part of the State from the Lower-Ohio watershed. The least yield was from the Maumee River basin.

PACKER TRUCK Saves Money

B. I. GILBERTSON,
Sanitarian, Moorhead, Minn.

WE HAVE a packer type refuse box that replaced an open truck. This type of a packer box has given us so much better service and cost us so much less money to operate that if the price was twice as high we would still want it.

We have in our city five compaction collection units, four of which are Gar Wood, that have been in service for up to 5½ years, but the unit that we replaced the open box with is the M-B Packer manufactured at New Holstein, Wisconsin. This truck is only used for the commercial area such as grocery stores, restaurants, and where there is refuse to be collected on main streets.

Since starting to use this box we have saved up to 7 trips a day to the sanitary landfill. We used to haul 10 loads with the open box but now we haul only three. Up to date we have no data on just exactly what it has saved us in dollars and cents, but anyone can see that three trips a day costs a lot less than 10 trips a day. We only use two men for the collection work, the same as we used with the open box. We tried it one week on residential pickup, and the number of times that the compactor had to be used would be only once for each two blocks of houses, or approximately 24 houses.

We are convinced that when our open-box trucks are retired they will be replaced by packer-type units, as we have found that the cost of operation is a great deal less.

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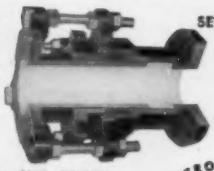

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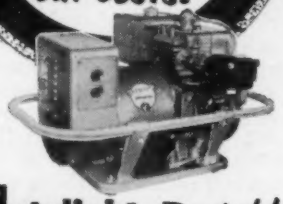

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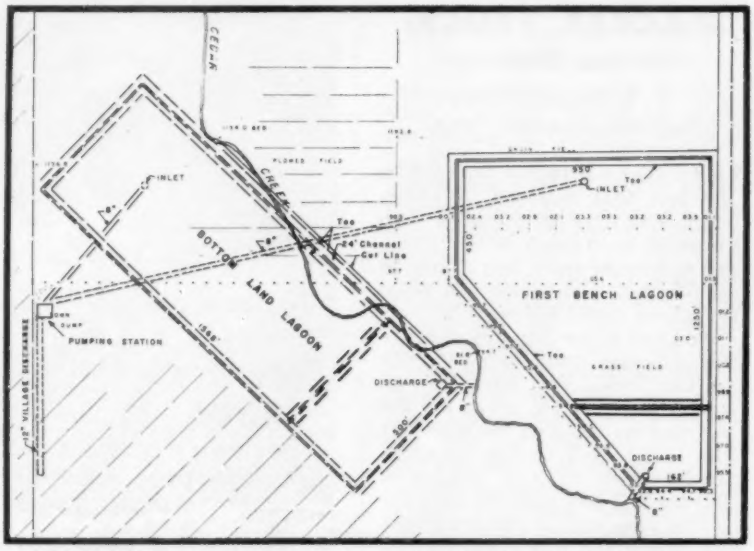
A STUDY OF SEWAGE LAGOON DESIGN FACTORS

R. L. SMITH and H. C. LEIBEE,
Consulting Engineers,
St. Paul, Minn.

THE TWIN TOWNS of Triumph and Monterey lie in southwestern Minnesota and each town is serviced by a separate railroad; this is the basic reason for having two abutting communities separated only by the width of a residence street. It is customary to refer to these two communities as Trimont and this abbreviation is used herein. The present combined population of the towns is about 950 and, with the population graph projected to 1980 and the potential industrial waste added, the design population equivalent will be 1800. Trimont has a system of tile drains, but it is proposed to construct an entirely new sanitary sewer system. The old tile drains and the proposed sewer system both empty into Cedar Creek, which lies north and east of the community. Cedar Creek has some flow for most of the year but, for effluent dilution purposes, it must be classified as a dry water course. The community is surrounded by excellent farming land, rolling but all tillable, with farm buildings located at about one-half mile intervals. The land in the creek bottom is black alluvial soil for a depth of four to five feet. Above the bottom land, the black top-soil is two to three feet thick, covering clay. At the top of hills, the top soil reduces to about a foot, this overlying about three feet of gravelly material, and this is above the clay. This combination of soils produces a farm land that is excellently equipped to store water during drought periods.

In preparing cost figures for the construction of a lagoon, the following design figures were used, these figures being partially determined by standards set by the state. First, the lagoon should be designed on the basis of one hundred equivalent people to each acre of lagoon surface; second, land should be purchased equal to about four times the area of the lagoon; third, the lagoon should be at least one-half mile from Trimont and one-quarter mile from any homes; fourth, multiple units should be used; and fifth, the lagoon should have a total depth of eight feet, the liquid varying between three and five feet, the latter depth being used only during the winter months. The estimates are based upon the conclusion that a minimum of two feet of compacted clay must be used on the inside of the dikes and the bottom of the lagoon. No alluvial soil is figured in the estimates as being used for the inside of the lagoon.



● **TWO POSSIBLE lagoon sites are shown. Location in the bottomland area was considered preferable because it did not border on the highway, but cost was greater.**

The fact that the farm land near Trimont is the finest of farm land and homes are located at regular half-mile intervals made the location of a lagoon extremely difficult in comparison with such conditions as exist in country where land is cheap and homes are well isolated. The use of bottom land was found to be uneconomical as it was considered necessary to use compacted clay as lining material. It would have been necessary to remove the alluvial material and replace it with clay hauled from a pit not in the area of the lagoon site. Consideration was also given to the fact that high water occurred periodically and at an elevation that would have flooded and destroyed a lagoon constructed only slightly above the creek. The most economical location was determined as being on the first bench, about ten feet above the bottom land, and at a location that included clay at a reasonable depth. This location provided a much lower cost for the lagoon but did border a fairly heavily traveled highway. Other locations were further away from Trimont with a consequent increased cost in piping and also had faults as to locations of homes, availability of clay, land that was not sufficiently level, etc.

Cost Data

Following is the estimate of cost for a lagoon built in the bottom land: stripping and disposal of soil, 294,000 cu. yds. at 25 cents, $73,500;

clay for lining and banks, including placing and compaction, 117,800 cu. yds. at 30 cents, $35,340; land purchased, 80 acres at $250, $20,000; pumping station $15,000; 8-in. pipe, pumping station to lagoon, 700 ft. at $4, $2800; intake structure $200; discharge structure $2200; fence, 4,400 ft. at $4, $17,600. This totals $166,640, and to it should be added 10 percent for engineering, legal and other costs making a total of $183,284. The estimated cost of upkeep or operation are: Power $500; weed clearance and erosion and rodent damage repair, $1650 (about 5 percent of the clay item); depreciation of pumping structure, fence, pipe, etc., 2 percent of $37,800 or $756. The total cost was estimated at $2906 per year.

The cost of the first bench lagoon was estimated at $129,118, including engineering, legal, etc., at 10 percent; stripping and disposal of top soil, 116,000 cu. yds. at 25 cents; clay for lining and banks, including compacting, 84,600 cu. yds. at 30 cents; 2,200 feet of pipe; and 4,200 ft. of fence. Other costs were the same as for the bottom land lagoon. Annual cost of operating and maintaining was estimated at $2,525 per year.

The cost of a standard waste treatment plant was estimated at $126,454. This included a primary settling tank at $8,846; a control house with sand beds for sludge drying at $37,452; a trickling filter using tile media at $23,360; a final settling tank at $19,000; and grading, electrical, piping, fencing and miscellaneous items at $26,300. The total cost of these items amounts to $114,958 and an additional 10 percent is allowed for engineering and legal upkeep. Operating costs were estimated at $5,000 per year, including power at $975; labor, sharing with other utilities, $2400; repairs $300; chemicals and haulage $1025; and heat $300.

Economic and Other Comparisons

Under the conditions at Trimont, using similar estimating methods, the cost of the lagoon and the standard treatment plant are practically identical, the lagoon having a saving of about $2,500 in yearly operational expense. To evaluate this saving in yearly up-keep expense, it is necessary to view all the other factors that are part of the final determination of the choice of method of treatment. These include:

Quality of Treatment—The standard treatment plant was designed on the basis of producing an effluent with a ppm BOD of 30 which is

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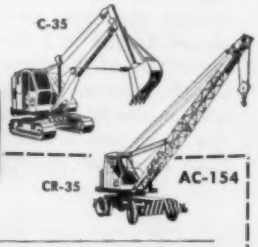

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Engineers in charge of new Municipal Water Works filtration systems are more and more favoring the SPARKLER DIATOMITE FILTER MODEL SCJ because:—

1. The original cost of a diatomite plant for public supply is ½ to ⅓ the cost of a sand plant of equal capacity.
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3. Turbidity less than 5 P.P.M. can easily be maintained at all times even though the raw supply fluctuates greatly. Channeling, mud balling and other common sand filter shortcomings are never a problem.
4. Operating cost compares favorably with conventional sand.

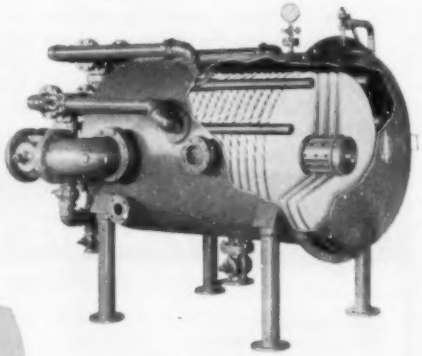
Less than 0.2% of water is required to sluice and clean the Model SCJ filter. The largest filter units can be cleaned and a new fresh diatomite pre-coat applied and the filter back in operation in 20 minutes or less.

Operators can be easily trained to handle this filter, no highly skilled specialized personnel is required to insure efficient performance.

Sparkler Model SCJ filters can supply practically any required volume of city water. Single units with a capacity of 5,000,000 gal. per day are available. Multiple units including a standby filter is usually employed to insure uninterrupted service for large volume requirements.

Modern electronic control instruments are readily adaptable to these filters, making uniform high quality water supply sure and automatic.

The startlingly low original cost, simple operation, and positive, consistent high quality filtration makes the Sparkler Municipal Water Works filtration system worthy of the most thorough consideration by water works engineers.



Interior construction of Model SCJ Water Filter. Sparkler filtration engineers have introduced, in the SCJ filter, new principles of diatomite filtering that are much superior to old methods and comprise the most advanced innovations in recent years.

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adequate for the conditions at Trimont. It is more than probable that the lagoon would produce an effluent of 10 ppm BOD which is an advantage for the lagoon.

Odors and Ground Infection—It is not believed that odors of lagoons would be particularly objectionable except after the ice break-up and during the summer dog-days. The clay soil at Trimont should prevent any well contamination.

Fertilizing Minerals—The standard treatment plant, using chemical treatment of sludge, will remove an appreciable share of the minerals. The lagoon will retain most of the minerals and will have an excessive growth of algae with later decomposition.

Protection of Health—Opinions expressed recently by a considerable number of bacteriologists are that both pathogenic bacteria and viruses can live for long periods of time in lagoons, always assuming that the water is turbid and nontransparent to the radiations of the sun. The latter condition will exist during all the period of algae growth. The standard treatment plant provides for chlorination of the treated sewage and also provides a killing agency by reason of the competition for life in the various treatment units. In determination of process, health protection is a very vital consideration.

Psychological Factors—In the case of a community with a very high quality of land, such excellent farms and the nearness of the farms to each other, any discussion of lagoons wherein they are described as "raw sewage ponds" produces an instant hostile reaction. It is not believed that such a community would accept a lagoon as a method of treatment. In discussions with sportsmen's groups, the theory of shooting wild fowl after feeding on raw sewage has not been received with cordiality. There is also the picture of the small open spot in the lagoon, open all winter because of the entry of warm sewage, as the water supply for all the wild birds and small animals in the vicinity.

• • •

Spraying Roadside Trees To Control Insects

Spraying of trees on highways and in county parks in Wayne Co., Mich., during 1956 was done almost entirely with mist-type spraying equipment for the control of the Dutch elm disease carrier, the European bark beetle, and the

various scales and leaf-eating insects. A total of 12,947 gallons of 25 per cent DDT elm spray was used in both the dormant and summer applications. The dormant or early spring applications covered 45 miles of county primary and state trunkline highways. These applications required 1,769 gallons of the elm spray. Approximately 400 acres of county parks were sprayed using 798 gallons of elm-spray material. Summer applications of 25 per cent DDT Dutch elm spray covered 1,300 miles of county primary and local roads and state highways. Approximately 10,380 gallons of spray material were used.

• • •

STORM SEWERS ELIMINATE LOCAL FLOODING

STANFORD L. BESSE,

Supervisor of Planning and Engineering, Plymouth, Mich.

THE CITY of Plymouth has two storm sewer contracts under construction: (a) Northwest Area storm sewer costing approximately $74,180; and (b) Southwest Area storm sewer costing approximately $80,361.

Northwest Area—This contract involves 4730 lin. feet of 8, 12, 24, 30, 33, 36, and 48-in. storm sewer; 16 manholes; 10 catch basins; one concrete headwall and miscellaneous cleaning and deepening of existing inlet ditches. The storm sewer, when completed, will provide drainage facilities for a recently annexed 85-acre area in the northwest corner of the City.

In the 85-acre tract are included a 50-acre area now being surveyed in anticipation of a new subdivision; the remaining 35 acres are owned and are being developed by the Western Electric Company, including a building under one roof of about 400,000 square feet. This project is being financed, in part, by the use of special assessment; the City contribution is $5,168.

That portion adjacent to Goldsmith Avenue will be greatly benefited inasmuch as the discharge from two drainage culverts under the C & O right-of-way will be conducted underground, thus alleviating seasonal flooded conditions.

Southwest Area—This contract involves 11,720 lin. feet of 12, 15, 18, 21, 24, 33, and 42-in. storm sewer; 43 manholes; 63 catch basins, 2000 feet of 8-inch catch basin connec-

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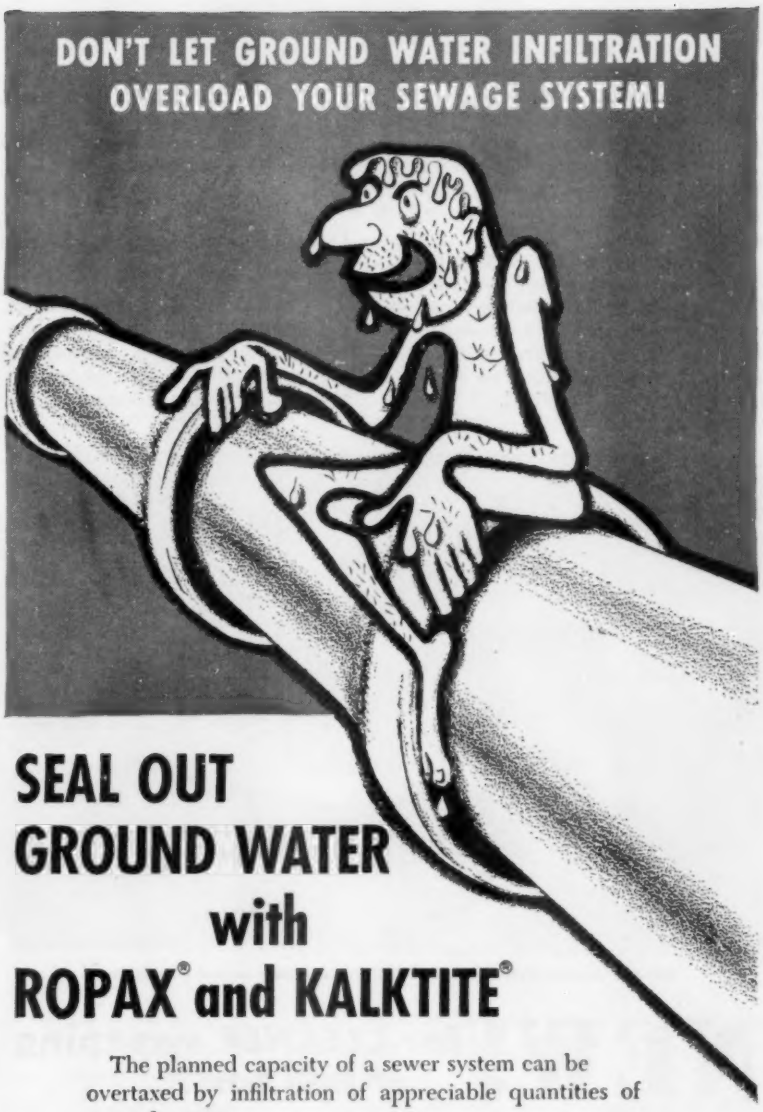

SEAL OUT GROUND WATER with ROPAX® and KALKTITE®

The planned capacity of a sewer system can be overtaxed by infiltration of appreciable quantities of ground water.

Both ROPAX and KALKTITE are specifically engineered to eliminate this problem.

ROPAX, a non-porous packing impregnated with selected asphalts, provides *additional* joint sealing material. Its fibrous core compresses and conforms to the shape of the pipe bell, forming a solid seal impervious to water passage.

KALKTITE, a cold-mixed, cold-applied asphaltic cement, completes sealing. It sets up internally under the most adverse conditions, forming a dense, tough, flexible seal that *cuts infiltration to a minimum.*

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tions; and one concrete headwall. This system was designed to facilitate storm drainage in "Hough Park No. 2 Subdivision" and "Parklane Subdivision", two new subdivisions in the southwest part of Plymouth. The catch basins mentioned are installed to agree with the proposed curb and gutter line as delineated on the plans:

This project will also provide additional storm drainage in parts of "Hough Park No. 1 Subdivision"; an older subdivision lying north of the two subdivisions named above. It is being financed by the use of our special assessment method.

The development of the "Northwest Area" and the "Southwest Area" storm sewer projects described herein will place this portion of Plymouth in a "worry-free" position as far as local flooding conditions are concerned.

• • •

How to Get the Most Out of a Septic Tank

The new *Manual of Septic Tank Practice* just issued by the Public Health Service is the most complete text on the subject ever issued. In considering the importance of the individual septic tank, it is estimated there are six million such installations serving 24 million people: and that one-third of the new homes being built have to rely on septic tanks. If there are a million houses built every year, and each tank installation costs only $300, the annual expenditure amounts to around $300 million. This investment should be safe-guarded and health protection should be provided.

This text does a good job in both fields. It starts out by saying that a connection to an adequate public sewerage system is better than any septic tank, no matter how well designed and built. Then it goes on to discuss ways and means of getting a good job. Determining the suitability of the soil and making the necessary percolation tests is the first step. In really tight or otherwise unfavorable soils, the septic tank and leaching field may not have a chance. However, provided the percolation tests are favorable, directions are given in detail for constructing leaching systems, for distribution boxes, for inspection and for seepage pits. Design is based on the number of bedrooms.

Items discussed regarding septic tanks are capacity, location, general specifications, outlets and inlets, tank proportions and depth factors. Tanks may be single compartment, or have up to four chambers; liquid depth may be 30 to 60 ins. Tanks may be of concrete, precast or built on the job; tile; metal; brick or block. The need for cleaning at reasonable intervals is stressed. In general, no proof exists that normal use of household chemicals interferes with operation.

Part II covers the use of septic tanks for institutions, recreational areas and many types of establishments. It gives data on water use and sewage flows for such places as drive-in theaters, restaurants, camps of various kinds, country clubs, factories, airports, stores and service stations. In these places, grease traps may be necessary and their design is covered adequately. Leaching fields, sand filters and chlorination are discussed with design data.

The text is very well written; as with most Public Health Service jobs, many had a share in the preparation so it would probably be unfair to credit any one man above others. The title is given above. It is Public Health Service Publication 526 and it can be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 35 cents; 85 pages, 29 illustrations.

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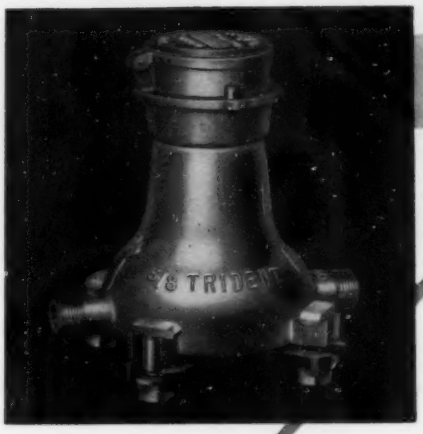

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It takes money to maintain the water supply your community expects. It's vitally important to make sure all the water pumped is paid for . . . by using accurate meters . . . and by keeping these meters in good repair.

Trident meters are built to hold accuracy longer, so you receive all the revenue you should. They're built to be easier to repair, so your shop time and expenses are cut down. They're designed so that the newest parts fit the oldest meters . . . simplifying your repair parts problem, helping you to get accurate, thoroughly modern performance from your oldest meters.

For more than 50 years, Neptune has built fine meters designed to earn more and cost less. Many 50-year-old Tridents are still in service . . . perhaps in your own community . . . living proof that the Tridents you buy today will be a credit to your water system for many long years to come.

277

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1430 Lakeshore Road • Toronto 14, Ontario

Branch Offices in Principal American and Canadian Cities.

"Material-handling worries ended," reports leading Wisconsin building contractor

TIME, LABOR COSTS CUT IN HALF by versatile Michigan Tractor Shovel

Savings of 40 to 90% in time and 50 to 75% in labor costs resulted when the Selmer Company, Green Bay, Wisconsin, assigned material handling to this Model 75A Michigan Tractor Shovel.

"You might say the Michigan combined the mobility of a pickup truck with the traction of a crawler," explains one Company official. "It certainly eliminated the usual problems of unloading and moving building supplies: the slow expensive hand labor . . . the slowness and lack of mobility of crawler-loaders . . . the lack of capacity of easy-to-get-stuck farm-type tractors."

Saves 3 man-hours unloading blocks

In the two years since its purchase, Selmer has handed dozens of jobs over to the 1¼ yd 80 hp Michigan. Above is a common assignment—moving palletized concrete blocks from trucks to scaffolding. Unit lifts 68 blocks, weighing 3,800 lbs AT ONCE. These are stacked 10 ft high so laborers can skid blocks direct onto scaffolds. Entire job, including stacking, takes two men 10 minutes. Unloading alone used to take five hand-laborers an hour. And an elevator had to be set up and used continually.

Saves $15 to $25 per brick truck

Similar savings are reported when brick is handled. It used to take four men using brick tongs three hours to unload a semi-trailer. Now, Selmer has the bricks palletized in 500-unit lots, 12 pallets to the semi . . . unloading takes the Michigan and two men 10 to 15 minutes. Smaller trucks carry 4 pallets, take 5 minutes to unload with the Michigan compared to 1½ hours with four hand laborers. Savings average $15 to $25 per truck *including* extra charges for palletizing!

Replaces expensive crane to unload marble

Unloading carloads of marble or cast stone always gave Selmer Company a costly headache too. Formerly, they

rented a crane. Recently, however, their veteran shop foreman, Norb Tilkens, designed and fabricated a special boom which attaches to the tilt bracket. With this, the Michigan reaches across a truck, lifts two or three slabs of marble from the railroad car, gently lowers each 700 lb load to the truck bed. In a few hours, the car is completely unloaded. Savings on a typical 15-car shipment run $500 or more.

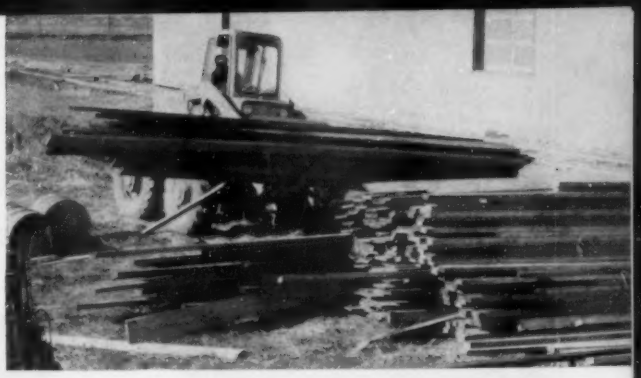
Eliminates ramps, pump set-up for concrete

Above is another home-made attachment . . . a concrete bucket which can be lifted on the Michigan forks. It carries four wheelbarrowfuls per load. Pour is made simply by tilting forks slightly forward so concrete flows out of 6" square spout into forms. Time and labor of barrow-men are saved. Nor does Selmer have to build ramps or, on small pours, set up a pump.

Handles wide variety of other materials

Lots of other materials have been handled from time to time. Some of them are:

Rip-rap — old brickbats and concrete dozed into river to protect building.



Lumber — as much as ¾ of a truck load (3500 to 4000 lbs) unloaded at once, stockpiled, later carried to hoist.

Rolls of reinforcing wire—carried on forks, stockpile to hoist. Fork spacing changed in seconds to fit roll openings.

Trash — cleaned from around building site.

One man changes bucket, forks

Some of these jobs, you'll note, call for fork lift, some for tractor shovel bucket. These two attachments (and others) are easily interchanged. It takes Selmer's operator, John DeMoulin, working alone, 10 minutes.

In two years, NO breakdowns

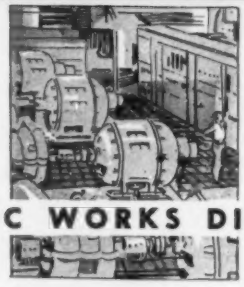
No matter what the job, Selmer Company can *depend* on their Michigan working a full day! "In two years . . . over 6,000 operating hours," recalls Shop Foreman Tilkens, *"we've NEVER had the machine break down* on the job. It has saved us over 50% in time and manpower!"

A Michigan could do as well for you!

Michigan is a registered trade-mark of

CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2499 Pipestone Road
Benton Harbor 28, Michigan
In Canada: Canadian Clark Ltd., St. Thomas, Ontario



PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE WATER WORKS DIGEST

Better Conditioning Solves Water Filtration Problems

Monticello, N.Y., being an important resort village faced with a water shortage during the critical summer months and bothered by tastes and odors made improvements to its water system at a total cost of $300,000. The improvements to the supply line and distribution system included about 19,440 ft. of a new 14-in. mechanical joint cement lined cast iron main from the Lake pumping station to the new 500,000-gal. elevated storage tank to supply adequate pressure to the higher areas of the village and for fire protection.

The water from Kiamesha Lake is typical Catskill surface water. It is soft, low in alkalinity, with seasonal turbidity and subsequent taste and odor problems. On coagulation, it forms a light and feathery floc which settles slowly, resulting in floc being carried over onto the filters thereby reducing the filter runs and increasing the amount of wash water necessary for adequate washing of the filters. The new treatment plant included a flash mixer, a flocculating compartment and a circular clarifier, all constructed as a unit. There are four circular filters each supplied with Palmer surface wash equipment. The annual chemical savings by reason of the new plant are conservatively estimated at $2000. Another important source of savings comes from the marked reduction in wash water required. This ranged as high as 12 percent whereas with the new plant it was well under 4 percent at all times in 1956. Another saving of about $2000 per year was expected by adopting electric drive and using the old diesel engine for standby.

"Better Conditioning Solves Water Filtration Problems." PUBLIC WORKS, June.

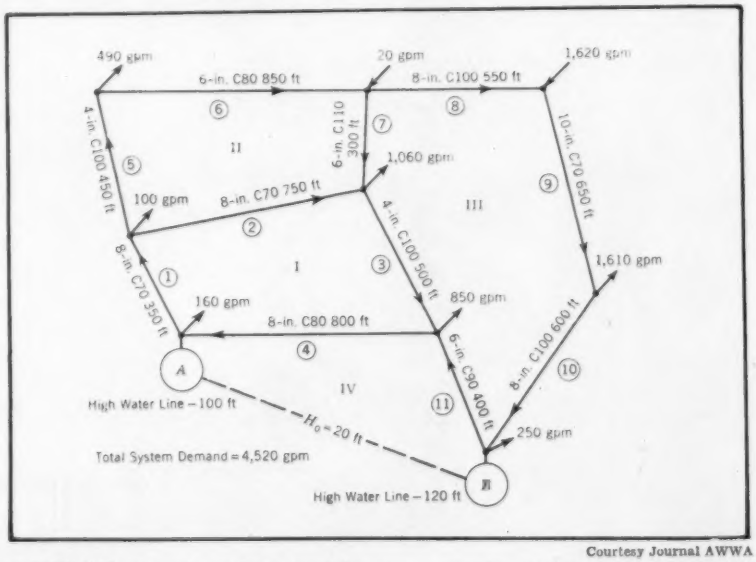
National Water Policy—a Restatement

The Engineers Joint Council Board of Review has presented its 1957 report reviewing the report on "Principles of a Sound National Water Policy" which was prepared by the Council in 1950. The general conclusions were: 1) Subject to the principles of economic justification set out later herein, plans for the development and use of water resources should provide for maximum utilization of these resources, the objectives of such source development including the safeguarding of our resources against deterioration from soil erosion, wasteful forest practices, and floods; the improvement and higher utilization of these resources to support an expanding economy and national security; assistance to regional development; expansion of all types of recreational opportunity to meet increasing needs; and protection of public health; 2) Consideration and control of the waters of the United States are in the national interest, but not necessarily a function of the Federal Government, with the individual doing what he can and that which requires collective action being done at the lowest governmental level practicable; 3) Beneficiaries of federal water-resource projects should reimburse the Federal Government for their equitable shares of the project costs; 4) Project reports should be clear and forthright, presenting all costs as accurately as possible, proposed reimbursement plans, and the amount of federal subsidy, if any; 5) All projects within a river basin should, where practicable, be coordinated within the framework of a comprehensive plan which will assure maximum effectiveness in the development of the basin; 6) There should be a Board of Review for the impartial analysis of all federal water-resources projects; 7) All federal agencies engaged in water-resource development should conform to the same basic policies.

"Principles of a Sound National Water Policy—a Restatement." By Engineers Joint Council Board of Review. *Civil Engineering*, May.

Computer Performs Hardy Cross Analysis

Distribution system analysis by use of an electronic digital computer is best approached in the basic Hardy Cross iterative technique, because the machine is primarily capable of only the simplest arithmetic manipulations. The lengthy step by step process poses no problem since com-



Courtesy Journal AWWA

● **PIPELINE network analysis involving two reservoirs at known elevations and two constant rate inputs is quickly solved by use of electronic digital computer.**

FOR THE BEST IN *Water Meters*

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ALL AMERICAN

AMERICAN METERS

Build Water Revenue

Here are some of the design features of American Meters that help you build Water Revenue:

A. A thick reinforced measuring disc is used to reduce slippage between the disc and measuring chamber wall. With this construction the clearance can be sufficient to prevent damage from grit or scale and still make a more efficient seal than is possible with a thin disc at the same clearance.

B. The seal between disc and measuring chamber is maintained in any position.

C. Absence of a thrust roller reduces friction and avoids noise.

D. Precision machining of all parts reduces friction and wear for continued measuring accuracy.

If you want full revenue from the water you supply, "go all AMERICAN."

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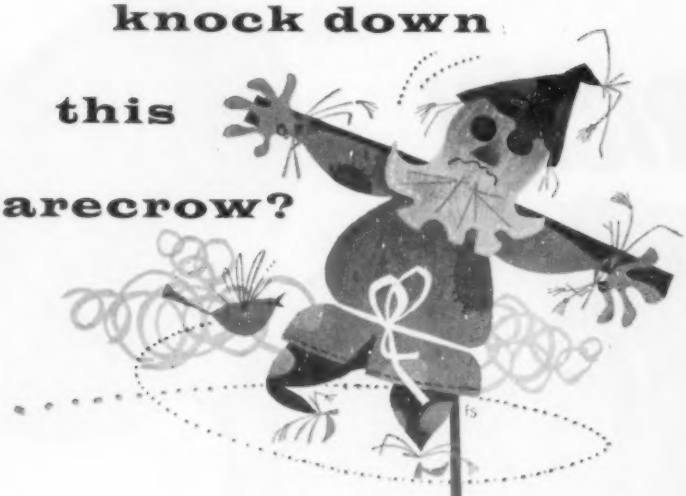
mind if we knock down this scarecrow?



Stuffed with straw though he is, he sometimes looms like a bogeyman in discussions of municipal water supply. For he represents the idea that diatomite filtration of water supply requires an unusual degree of skill and training on the part of the operator.

Now this is simply not so! The experience of the communities now employing diatomite filtration for their potable water supply is ample evidence that you don't require a highly trained technician to operate a diatomite system. Rather, it tends to show that anyone having intelligence for a responsible municipal job can easily and quickly learn to operate a diatomite filtration system with completely satisfactory results. Granted, where pre-flocculation or other pretreatment of the raw water is used, it helps to have an operator with some technical training, nor do we mean that a diatomite system can be operated by any ten-thumbed fumbler.

Simply and plainly, we say merely this: the operator of a well-designed diatomite filtration system requires no higher degree of skill and technical knowledge than is demanded for the operation of a conventional rapid sand filtration system, which depends so largely on flocculation and chemical treatment. And the experience of the communities now filtering their municipal water supply with Dicalite Filtraids backs us up!

Send for our Bulletin F-552 for more complete information.

Dependable GLC GREAT LAKES Dicalite DIATOMACEOUS MATERIALS

dicalite division, *great lakes carbon corporation*
612 south flower st., los angeles, california

putations can be made at a rate of 200,000 or more per hour. Individual instructions and data are stored as magnetized spots located on a revolving drum, and actual arithmetic computation takes place in "accumulator" components. The data and instructions are received from punched cards through an automatic card "reading" unit. Eight different solutions were performed for the Palo Alto, California, system, requiring about 2¾ hr. of machine time and including key punching and engineer's tabulation and checking time. While the procedure developed has thus far been used only on water distribution systems and only with the Hazen-Williams formula for friction losses, it should be adaptable, with minor modifications to any fluid flow network.

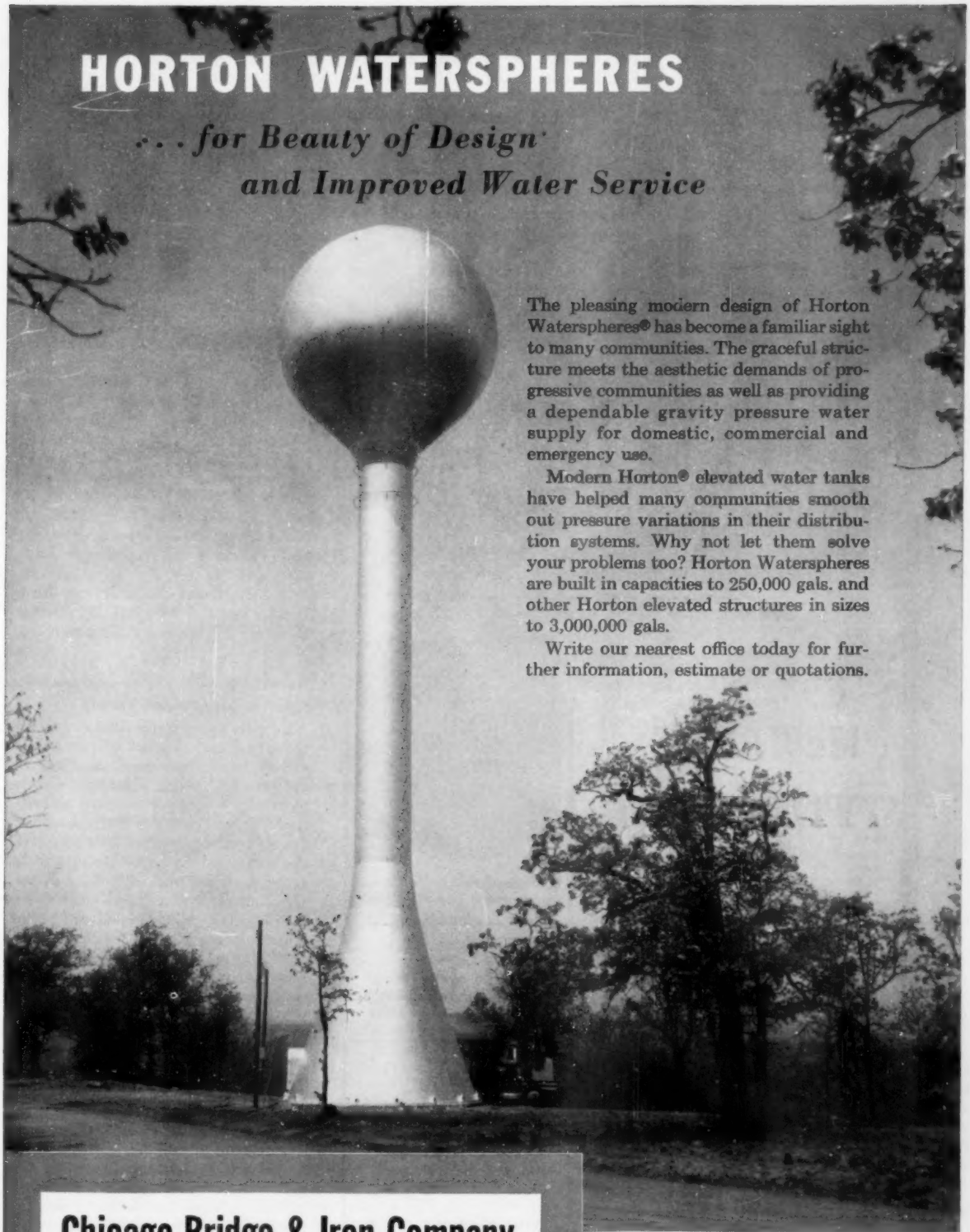
"Pipeline Network Analysis by Electronic Digital Computer." By L. N. Hoag and Gerald Weinberg. *Jour., A.W.W. Assn.,* May.

Controlling Reservoir Evaporation Losses

There are several methods of reservoir evaporation control, but this article reports primarily on some interesting research studies on the monomolecular film technique of retarding evaporation, being undertaken by the Southwest Research Institute, in cooperation with several other agencies. The use of this film technique to retard evaporation on a large-scale basis is a fairly recent development, although this property of certain types of organic chemical compounds has been recognized for a long time. Dr. Langmuir reported some results in 1927 on the successful use of hexadecanol as a retardant to evaporation. A review of the first year's work at the Southwest Research Institute, using hexadecanol and other film retardants, shows a great deal of promise based on laboratory and small tank work. For general, field, and large-scale applications, there are a number of problems requiring further study, notably the actions of microorganisms and wind. It has been calculated that, on the basis of an application rate of 2.2 pounds of evaporation retardant per acre, a reduction in evaporation of 45 percent and a film life of thirty days may be expected. At the same time the cost of saving (or producing) an acre-foot of water is about $1.60, or approximately one-half cent per thousand gallons. The ultimate objective of this research program will be to develop a practical and inexpensive method of reservoir evaporation control that will be of maximum

HORTON WATERSPHERES

. . . for Beauty of Design and Improved Water Service



The pleasing modern design of Horton Waterspheres® has become a familiar sight to many communities. The graceful structure meets the aesthetic demands of progressive communities as well as providing a dependable gravity pressure water supply for domestic, commercial and emergency use.

Modern Horton® elevated water tanks have helped many communities smooth out pressure variations in their distribution systems. Why not let them solve your problems too? Horton Waterspheres are built in capacities to 250,000 gals. and other Horton elevated structures in sizes to 3,000,000 gals.

Write our nearest office today for further information, estimate or quotations.

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Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
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Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

CBI

125,000-gallon Horton Watersphere, 92 ft. to the bottom, erected for Tulsa, Oklahoma.

benefit to water users of the entire United States, especially the hot and arid sections, and for the rest of the world.

"Evaporation Control as a Means of Water Conservation." By B. W. Beadle and Robert R. Cruse. PUBLIC WORKS, June.

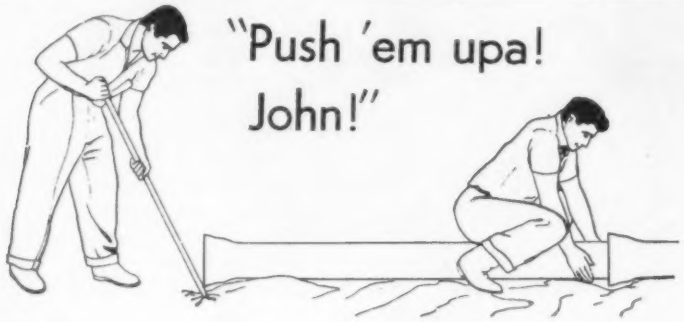
Water Works Construction—For a Nation on the March

America is a nation on the march—and America's public water supply systems are the common denominator of the nation's progress. The two major manifestations of our growth and progress are booming population and production and neither can be achieved without adequate water for America's communities and industries. In order to "catch the spirit" of this great progressive trend and to translate recent developments into future actions, the author and his editorial staff have conducted two surveys to ascertain the highlights of water works improvement projects carried out during 1956. The results of one survey lists the construction jobs which the chief engineers of the state health departments have nominated as "outstanding" in terms of importance and significance of the planning design, construction, financing or administration. The other survey obtained listings of water works projects which occupied the attentions of 100 representative consulting engineers during 1956, together with explanations of the functions and outstanding characteristics of the improvements, enlargements, and modernizations involved. Capsule comments in each of the following ten major fields of water works practice were made for the purpose of indicating the progress achieved by all types of communities, of all sizes, in all parts of the country—and of stimulating other communities to follow their inspiring examples: 1) Expanding sources of supply, 2) improving water pumping, 3) strengthening, extending, cleaning distribution mains, 4) metering of water service, 5) storage on distribution systems, 6) improvements in water treatment, 7) mechanization of water works, 8) instrumentation and automation, 9) modernizing billing and accounting, and 10) improving financing and administration.

"Water Works Construction—for a Nation on the March." By Morris M. Cohn. *Water Works Engineering*, May.

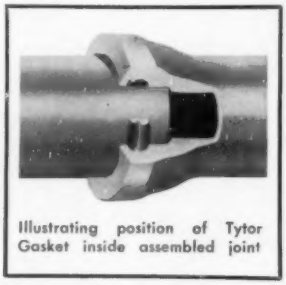
Desalting with Electric Membrane Filters

Electric membrane filters used in the desalting of brackish or saline waters have made real progress in the past few years. Desalting plants have been shown to be more attractive economically, better seasoned by field operating experience, and are commercially available in a wide range of types and capacities. Electric membrane plants have now been tested in more than 50,000 hours of operation in plants located from Hawaii to the Persian Gulf. Although most economical in the brackish water range (1,000 - 5,000 ppm), they have performed well on Texas radar towers (the Atlantic Ocean is 35,000 ppm) and are being tested for submarine use. A brief description of the theory and the operating characteristics of electric membrane filters is given in this article. The principal operating costs in electric membrane desalting are electricity and replacement of membranes. It is stated that electric membrane plants can desalt water and produce high potability water at total operating costs of less than $1 per thousand gallons and investment figures of less than $1 per daily gallon of capacity. Comparisons are made between the investment costs per daily gallon capacity of the Oklahoma City and Dallas plants



Pipe 8" or smaller in diameter may be socketed by pushing on the bell end with a crowbar or spade, anchored in bottom of trench.

McWANE'S
*TYTON JOINT
is easy



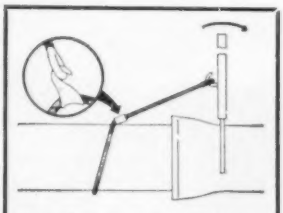
Illustrating position of Tytor Gasket inside assembled joint

TO ASSEMBLE

There are no bolts or glands. When the spigot is pushed into position, it is held tightly in place by the specially designed gasket. Hydrostatic tests show this joint will withstand pressures exceeding those required by standard cast iron pipe specifications.

Advantages include elimination of bell holes, easy and rapid assembly, and lower installed cost. Illustrated folder sent on request.

* Patent Pending



If preferred, a fork tool may be used to socket pipe.

McWANE CAST IRON PIPE COMPANY
GENERAL OFFICES & FOUNDRIES, BIRMINGHAM, ALA.
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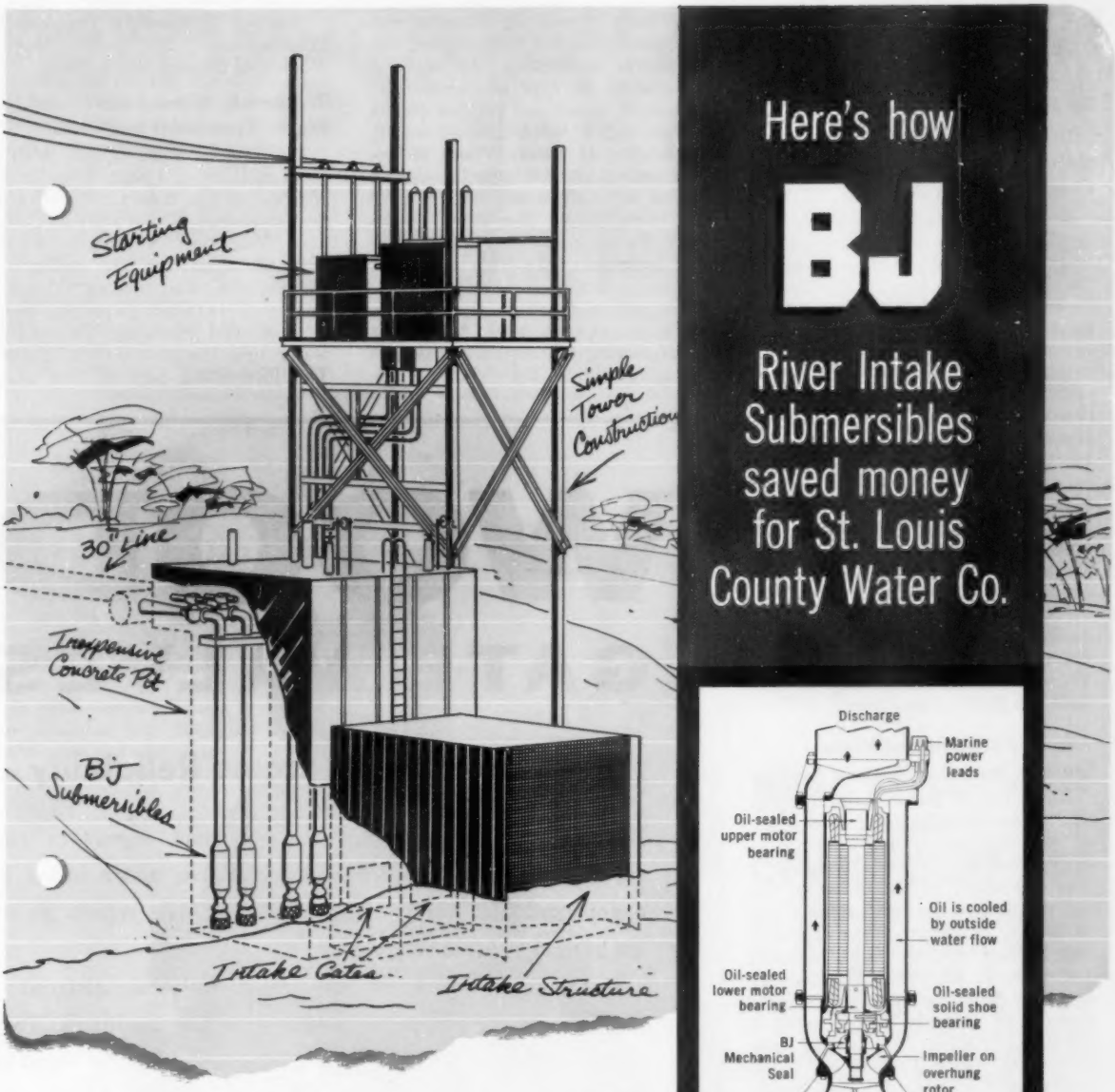
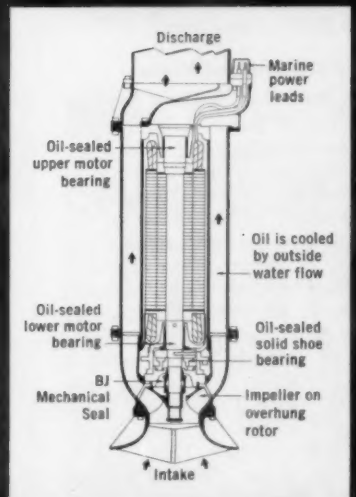


Here's how BJ River Intake Submersibles saved money for St. Louis County Water Co.



St. Louis County Water Company saved money on their South County Plant installation by using Byron Jackson river intake submersibles. Four completely submerged BJ motor-pump units eliminated the need for an expensive elevated structure to house motors above flood stage. Intake and pump structure are simple concrete pit construction. The only elevated structure is a low cost platform which holds starting equipment.

These BJ Submersibles are unaffected by flood or weather conditions... are always primed and safe from vandalism. The mechanically sealed, oil-filled motor is close-coupled above the pump with all bearings inside the motor housing. No bearings are in the pump itself. Thus no bearings are exposed to silty water. Each pump delivers 3500 GPM against a 100 foot head, and is powered by a 100 HP, 1750 RPM motor. One man, at a remote panel located in the main plant a mile and a half from the river, controls the entire operation.

No bearings in the pump!

All bearings are in the sealed, oil-filled motor.

BYRON JACKSON PUMPS
INCORPORATED
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BJ SINCE 1872

Write for complete "Submersible Facts" file including primary, booster and river intake uses.

and those of the electric membrane plants and are quite favorable.

"Fresh Water from Saline Sources by the Electric Membrane Process. By William E. Katz. PUBLIC WORKS, June.

Uniform Fluoride Levels in Water Systems

Maintaining uniform fluoride ion levels in a water supply distribution system is the subject of a study by the U.S. Public Health Service at Newburgh, N.Y. A statistical analysis of test data from two laboratories covering a 2-year period showed a rather normal frequency distribution with a narrow spread around the desired level of 1.1 ppm. In only 1 percent of the samples were fluoride ion test results below 0.9 ppm and in only 2 percent of the samples were the results above 1.3 ppm, with none exceeding 1.5 ppm. The median value was 1.105 ppm; the mean, 1.07 ppm; and the standard deviation, 0.084 ppm.

"Uniformity of Fluoride Ion Concentration in Newburgh, N.Y., Distribution System." By Floyd B. Taylor, U.S. Public Health Service. *Jour., A.W.W. Assn.*, May.

Taunton's Increased Water Storage and Distribution System

The City of Taunton, Mass., has undertaken a substantial renovation of its water supply and distribution system within the past few years. The $1,600,000 rehabilitation of the supply and distribution system has included: 1) Construction of a 22.5 mg. storage reservoir, with connecting mains to the existing system, 2) installation of new pumping equipment and controls at the existing pumping station within the city limits, 3) installation of additional pumping facilities at the supply source, Assawompsett Lake, and 4) installation of an elevated storage tank and appurtenances at Westville, a nearby suburb; as well as subsidiary improvements throughout the system. Thus, Taunton has secured not only the water storage capacity necessary during periods of maximum demand, but operating flexibility that previously did not exist.

"On-the-Line Storage and Modern Pumps Relieve 24-Hour Strain on Water System." By F. M. Cahaly and F. J. Turnbull. *Water Works Engineering*, May.

Factors Influencing Per Capita Water Consumption

Municipal water consumption will vary as influenced by a multiplicity of factors. The following, plus others, have their effects: 1) Climate, encompassing rainfall, temperature, atmospheric conditions, 2) size of community, 3) type of community, 4) cost of water and related effects of metering, 5) water quality and 6) availability of water. Where industrial consumption is large in relation to the over-all water use, it may well overshadow the other variations; the use curve may actually reflect business cycles. This report attempts to isolate some of the variables and to illustrate their effects on water consumption. A number of interesting tables and bar graphs are included.

"Factors Influencing Per Capita Consumption." By Ralph Porges. *Water and Sewage Works*, May.

Greenwich, (Conn.) new Water Treatment Facilities

The Mianus Filter Plant, with a rated capacity of 4 mgd, is the latest addition to the treatment works of the Greenwich (Conn.) Water Company. The plant facilities for treating and processing the water are conventional, i.e., mixing, coagulation, sedimentation, filtration, chlorination and pumping the treated water into the distribution system. The interesting part of this plant

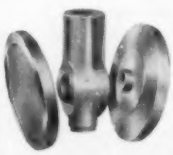
WOOD
GATE VALVES

First Choice for Extreme Reliability

Because of their inaccessibility underground, repairs to gate valves are always time-consuming, expensive, and a source of annoyance. And interruptions in service while repairs go on are hazardous for the community.

For these reasons, R. D. Wood Gate Valves are designed to function for generations no matter what the conditions. They are rugged in construction, fully bronze mounted, and tested to 300 lb. hydrostatic pressure. Designed for working pressures conforming to AWWA specifications.

Available with mechanical joint or flange-type pipe connection



SIMPLE IN DESIGN

Only three moving parts—a spreader and two discs which are free to revolve their complete circumference while being raised or lowered. Gates are lifted entirely clear of valve openings, providing unobstructed flow.

is in the method of construction of the settling basins and filters and also in the method of operation. After chemical mixing, the water flows to two Aldrich purification units which provide settling and filtration. Each unit consists of a series of concentric steel shells forming three compartments. The treated water enters the center of the unit, discharges at the top of the center column and is directed downward by the center well on the clarifier mechanism, and then flows radially toward the shell of the settling basin and onto the filters.

"The Greenwich Water Company Mianus Filter Plant." By Howard J. Carlock. *Journal of the New England Water Works Association*, March.

Other Articles

"Limiting **Currents in Membrane** Cells". (Hydrodynamic control may solve the problem of capacity and investment cost in electrodialysis for demineralizing waters in arid regions). By N. W. Rosenberg and C. E. Tirrell, Industrial and Engineering Chemistry, April.

"Water Treatment **Plant Modernized** as Part of Major Enlargement Plan." By Leonard N. Thompson, Water Works Engineering, May.

"Cleveland Fluoridates at Three Plants After 4-Year Court Action." By Frank J. Schwemler, Water Works Engineering, May.

"New Operation Center for **Indianapolis Water Company"**. By Lewis S. Finch and Gerald S. Lyons, Water and Sewage Works, May.

"Notes on **Water Works Law"**. By John H. Murdock, Jr., Water and Sewage Works, May.

"Water Works at **Geneva, Switzerland."** By E. Sherman Chase. Journal of the New England Water Works Association, March.

"Rapid Sand Filters **Replace 50 Year Old Equipment** at Philadelphia's Torresdale Water Plant." By Samuel S. Baxter and Myron G. Mansfield. Civil Engineering, May.

"Population Projections for Local Areas". By Meyer Zitter. Public Works, June.

"Copper Mining **Plant Squeezes Water** Dry." Public Works, June.

"Review of **Experiences with Microstrainer** Installations." By George R. Evans. Jour., A. W. W. Ass'n, May.

"A Survey of Operating Data for Water Works in 1955." An A. W. W. A. staff report which tabulates responses from questionnaires sent to 1,100 water utilities. Jour., A. W. W. Ass'n, May.

• • •

R. D. Wood Gate Valves also now available with O-Ring Stuffing Box seal when specified.

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Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (centrifugally cast in sand molds)

Make People Work for CIVIL DEFENSE

EDDY S. BRANDT,

Director, Civil Defense Corps
Evanston, Illinois

THE REASON that some people don't take Civil Defense seriously is that they are not given something concrete to do. In Evanston there are so many organizations and meetings, projects and "so forths", that we have had to be very definite in getting people to become volunteers.

Two years ago, we published a book telling about the various divisions of Civil Defense in Evanston and we distributed the book through the schools—12,000 copies. But the response was negligible. Five citizens out of the 12,000 signed up as volunteers.

So this first of May, we thought we would try a different way of interesting the people. The chief warden in the North Zone of Evanston called his group of workers together about the first of March and proposed that they secure 200 helpers who would distribute new Civil Defense literature to homes. Six or seven meetings were held, all for

two hours of work, on the evening of May Day.

The city press asked the citizens to put their porch lights on if they wanted the workers to leave the literature. By dint of hard work, the chief warden, Don Frey, and his assistants were able to line up 200 men and women who were willing to go to all the homes in the three wards that comprise the north zone of the city. Posters were put in all store windows by an energetic hardware store owner. Trains and other transportation were met by boys who distributed handbills. All the churches in the community were asked to put the announcement in their bulletins.

The volunteers were told to leave the literature not only where the porch lights were on, but in every home. The result was that 5,000 homes received 15,000 pieces of literature within two hours.

While this certainly aroused the interest of the 5,000 families, the best fruit of the work was the results of a double postcard which was sent to each of the 200 volunteers, thanking them for their help and asking if they would be interested in becoming wardens for Civil Defense. Almost half of the workers responded with signed postcards saying they would agree.

Another specific activity was a radiological protection school set up in rooms of the Technological Institute of Northwestern University. Classes in radiological protection and detection were given by Dr. B. J. Spence, retired head of the physics department of Northwestern. A very satisfactory number attended these classes and were graduated.

However, it is still felt that not enough people were reached who could help in case of either war or natural disaster.

So, for the National Alert Day on July 15, the Evanston Civil Defense Corps proposes to make a real test to see how many helpers can be secured on that day.

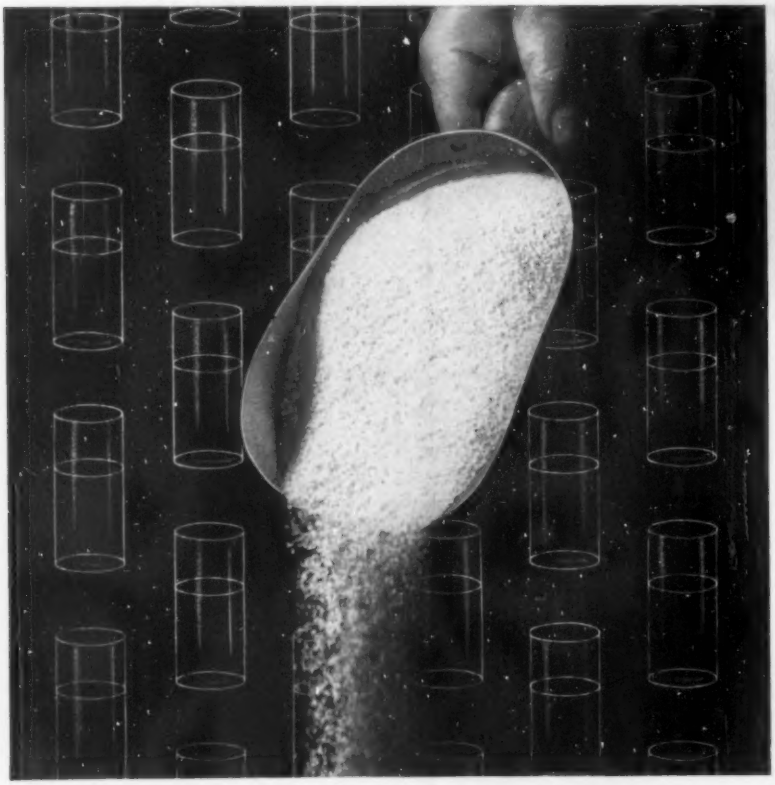
A year ago on National Alert Day, the Evanston Civil Defense Corps launched a "telephone tree" headed by a former Air Force lieutenant who actually experienced one of the major disasters in Texas. The test started at 11 a.m. By 11:13.5, 54 persons had been notified and by 11:32 74 had been alerted. Several "trees" were set up and put into motion all at the same time. In this method of communication, the first person is notified by headquarters. He calls the next person on his list and that person calls the next and so on until all have been notified and the last has called back to headquarters.

This year, we propose to do something concrete so as really to see how many workers we could secure within a few minutes. Consequently we are asking the various divisions to report to their nearest fire station (there are five in Evanston) immediately on receiving the telephone message. If possible, they are not to use their autos but to go on foot as if a bombing or disaster had paralyzed transportation.

When the first 12 workers have reached each of the fire stations, designated persons will call the Control Center and the time will be recorded. The next call from each of the stations will be when the entire group has reported and that time is to be made as short as possible.

It is supposed that these workers will go to the fire stations for the purpose of helping the firemen and police in the many ways that will be necessary in an actual bombing or disaster.

At a dinner meeting held late in May, the plan was enthusiastically accepted by the deputy directors of Civil Defense in Evanston and they all pledged their cooperation to the fullest extent.



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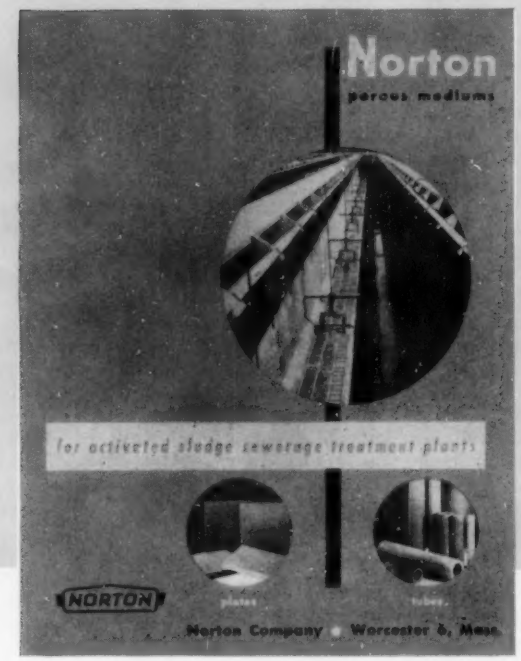

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BOOKLET NO. 140

For Municipal Water Filtration. Public works engineers all over the country know that among the most important aids to efficient low-cost filtration are Norton ALUNDUM* porous plates and tubes. This applies equally to the filtering of drinking water as well as water for swimming pools. For more complete helpful information you should have booklet No. 140 offered here.

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HIGH-RATE SLUDGE DIGESTION

A summary of recent literature

A. PRESCOTT FOLWELL

FOR SEVERAL YEARS studies have been made by plant operators and engineers to develop methods of increasing the rate at which sewage sludge can be digested in tanks. It seems to be the general conclusion that the chief essentials of successful high-rate digestion are continuous mixing, and feeding a sludge as concentrated as possible and as nearly continuously as possible. Continuous mixing is the more important of the two. Various procedures and types of equipment have been tried, keeping in mind the increased cost of operation as well as the possibility of reducing construction costs by the use of smaller digestion tanks.

A study of the problem was made at the Massachusetts Institute of Technology by operating a series of digestion units at detention times of 6, 8, 10, 15 and 20 days. They were fed twice a day and the contents mixed continuously by recirculation of gas. Volatile solids loadings ranged from 0.26 to 0.38 lb. per cu. ft. per day. Volatile matter destruction varied from 52.2 percent in the 6-day digester to 58.2 percent in the 20-day digester. Grease destruction was 53.0 percent and 71.4 percent respectively. Gas yield decreased in proportion to the volatile matter destroyed, practically all in the methane. The gas yield per pound of volatile matter destroyed seemed to have no definite relationship to detention time. Protein degradation in the 6-day digester was apparently 86 percent of that in the 20-day. The nitrogen and phosporous content of all digested sludges was quite uniform except in that from the 6-day unit, in which it was noticeably lower. The grease content of the digested sludge increased significantly as the digester time decreased, ranging from 6.65 percent in sludge from the 20-day digester to 9.50 percent in sludge from the 6-day unit. These investigators concluded that high-rate digestion units can operate safely using a 10-day detention period without significant sacrifice of gas production or degradation of sludge quality. By feeding an 8 percent sludge the total and volatile solids loadings will be approximately 7 times the conventional rate of feed.

At the Bowery Bay plant of New York City a pilot digestion plant was used to determine the highest rate at which it was possible to digest sludge satisfactorily. This plant was operated at rates which were increased periodically until it showed signs of failing. The pilot plant was provided with a mechanical stirrer and internal hot water coils. Thickened combined primary and activated sludge was applied at 2-hr. intervals seven days a week for more than seven months. At first the pilot plant and the plant tank received the same loadings, but the former was much more efficient as measured by gas production per day, probably due largely to the stirring which prevented accumulation of silt in the pilot, while about one-third of the plant tank was occupied by silt and a heavy gelatinous digested sludge and floating material. Data collected during this test indicated that, for a mixture of thickened primary and activated sludge, 5 days of detention with complete tank utilization would be desirable, equivalent to a digester capacity of about 0.2 cu. ft. per capita; or 0.4 cu. ft. to obtain practically all the available gas.

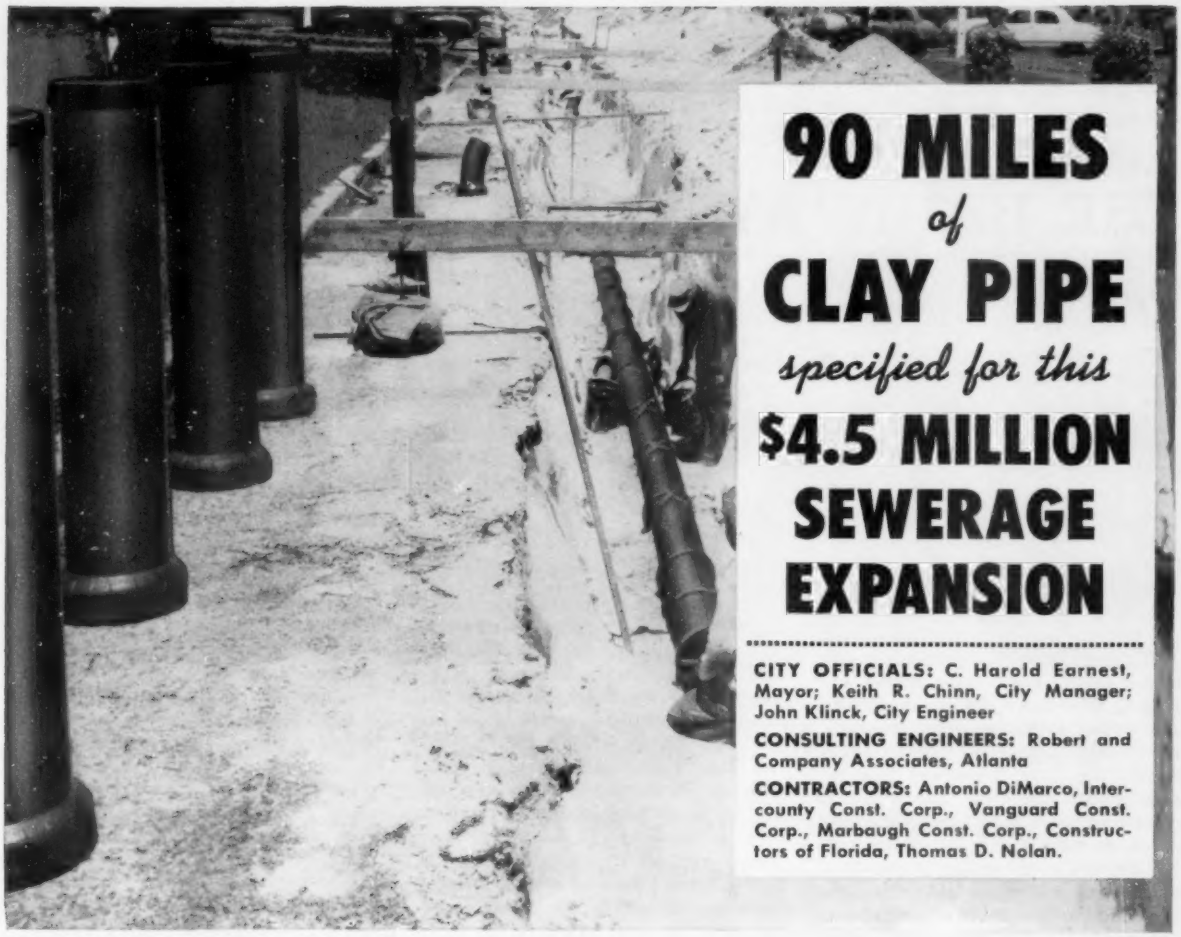
Every-day routine practice of high-rate digestion requires the solving of a number of details. Heukelekian suggests, among these, the dewatering of sludge from high-rate digestion; the storage capacity required for various methods of sludge disposal; the effect of interruption of feeding on subsequent digestion; storage capacity requirement for feeding raw sludge at a continuous rate with fluctuating solids received; and an effective method of utilizing tank capacity by mechanical means.

Some plants effect mixing in digestion tanks by mechanical devices, some by circulation of gas. Preliminary thickening of the sludge is generally effected by mechanical stirring and sedimentation; Beaumont, Texas, uses a thickener supplied by Dorr-Oliver Inc., the use of which produces a sludge of 8.7 percent total solids, and permitted a saving of $175,000 in cost of constructing digesters for 30 mgd.

Columbus, Ohio, in 1953 began operating one of its 106,000 cu. ft. digestion tanks by a process of accelerating digestion called the Catalytic reduction process. The principal feature is piping and a compressor for collecting digestion gas from the gas dome of the digester and distributing it into the digester liquid over an area 6 ft. in diameter in the bottom of the tank. Raw sludge is fed continuously into the digester in the center of the rising column of gas and digested sludge is withdrawn at the same rate. The gas is fed at the rate of 75 cfm. Sludge loadings on other tanks of the same size but operated conventionally have been approximately 9,000 lb. per day, but this tank has been loaded at 27,000 to 30,000 lb. and occasionally at 60,000 to 70,000 lb. When weekly samples of the tank contents show a gradual increase in the amount of volatile solids during a period of four weeks, the loadings are reduced. Experiments were conducted in 1956 for improving concentrations of solids in the digested sludge by pumping it into a concentration tank to settle. The percentage reduction of volatile solids in the high-rate digestion tank is comparable to that obtained in the conventionally operated tanks.

Topeka, Kansas, blows digester gas into a 100,000 cu. ft. digester using for this purpose six 1½-in. pipes that extend vertically from top to bottom of the digester and which had been provided for hot water heating of the digester. Each of these pipes contained ten ¼-in. holes at 2 in. vertical spacing. Gas was blown through these holes under schedules ranging from 2 hours out of 8 to continuously. The latter caused too great a solids content in the supernatant. Operation somewhere between one-fourth and one-half time seemed to be needed for complete scum control.

One of the features of high-rate digestion is securing digestive activity throughout the tank by preventing accumulation of sludge and scum in the tank. A design has been used in Germany, and adopted with modifications in a plant in Kansas, for securing this by the form of the tank itself. The shape of the tank approximates that of a sphere; the bottom third sloping on a 1:1 slope to a horizontal bottom about 3 ft. in diameter; and the top third sloping 1:1 to a top opening of the same diameter. Overflow pipes keep the depth of the sludge equal to the horizontal diameter. Raw sludge enters at the narrow bottom of the tank, preventing sediment from collecting there; and as all gas passes out through the narrow opening at the top, there is little tendency for scum to collect there.



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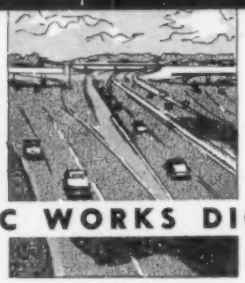


PUBLIC WORKS DIGESTS

Prepared by
FRANK FORCE
Associate Editor

THE HIGHWAY AND AIRPORT DIGEST

Residences and Freeways

The purpose of this state-wide factual study has been to determine how the market value of residential property is influenced by freeway construction. Through the collection and analysis of sales data, covering a three-year period of time, supported by a comprehensive study of the principal factors influencing the market ability of residential property along freeways, the following conclusions have been reached:

1) The annual trend in resale prices among subdivision homes adjoining free-ways, follows a pattern consistent with the price trend of comparable homes; 2) resales averaged from 1 to 2 percent less for residences adjoining freeways, as compared with similar homes one block or more away; 3) "financing" has become so important in the marketing of residential property that it is singularly capable of influencing the market value; 4) resale statistics reveal that residences adjoining a freeway can attain a higher price range than comparable residences; however, this occurred only among those residences located the greatest distance from the right-of-way fence and freeway traffic; 5) at the present time, nearly all residences adjoining California freeways are within tract developments.

"Residences and Freeways". By John F. Kelly, Headquarters, Right of Way Agent. *California Highways and Public Works,* March-April.

Lighting a Wide Main Street

In 1950, all through streets in Hollywood, Fla., were provided with 4,000-lumen enclosed lighting units; 2500-lumen Suburban units were installed on all medium traffic streets. On the wide main street 169 20,000-lumen mercury vapor luminaires on 30-ft. steel poles were installed. Twenty two units of mercury vapor luminaires are now being installed along the main street at an average cost of $525. The power costs per unit per month are $4.60 for the 20,000-lumen lamps on City-owned poles and $2.10 per month for the 2500-lumen lamps on Company-owned poles. The standards are made by Kerrigan and the luminaires are furnished by General Electric.

"Better Lighting For a Wide Main Street." By H. E. Pickle, Director of Public Service, Hollywood, Fla. PUBLIC WORKS, June.

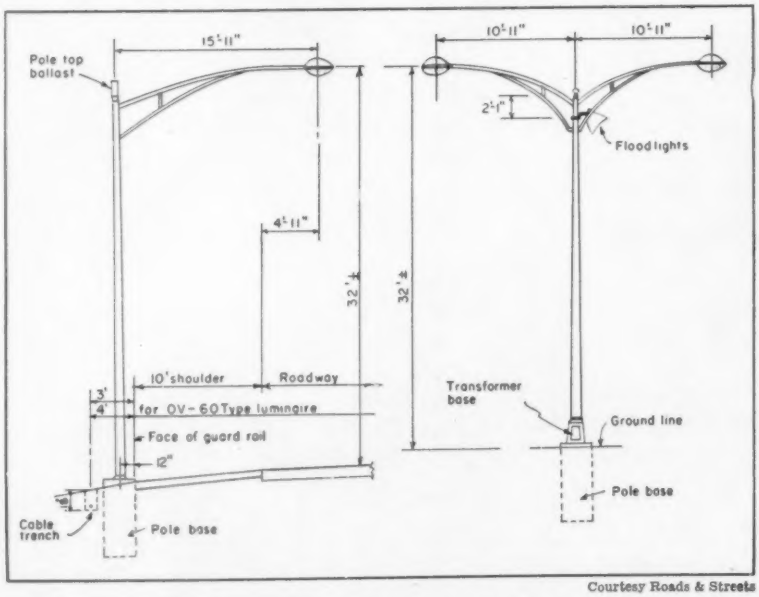
Lighting on Florida Turnpike

Modern high-intensity lighting at all interchanges, terminals and service areas is part of the design standards of the Florida Turnpike. Mercury vapor luminaires of 20,000 lumens and 49,000 lumens were installed with an overall total of 517 luminaires for the whole project. Aluminum standards were selected, having arms 15 ft. in length, to support lights over the roadways. The lights are 30 ft. above the pavement. Light intensity at interchanges averages about 4 foot-candles and intensity at toll booths is 10 foot-candles. Pole spacing is approximately 150 ft., staggered and poles are planted 10 ft. from edge of shoulder. The luminaires are slanted at an approximate angle to spread light intensity for full width of pavement.

"Lighting on Florida Turnpike Sets Example For Expressway Designers." By C. N. Conner, Highway Engineering Consultant. *Roads and Streets,* May.

How to Organize an Origin & Destination Survey

Traffic engineers have designed various types of origin and destination surveys to get the answers to, "Where are they going?" Which one is adopted for a particular study depends on the size and location of the area, the scope of the study, the time and money available, and of course the element of personal preference. The most commonly used surveys are the home-interview, roadside interview, and questionnaire postal card. The small-town engineer usually will choose between the roadside interview and the questionnaire postal card method. The first step in an O & D survey is to prepare the base maps and set up survey stations. The city



Courtesy Roads & Streets

● **POLE locations and types for two typical installations on the Florida Turnpike. Mercury vapor luminaires were used, with mountings as shown in the sketch.**

"ALWAYS READY TO GO TO WORK"

—clearing trees, pulling stumps, loading earth...and saving money

The scene: the City of Opelika in Alabama. The project: another street being prepared for paving by the Department of Public Works. The machine: a Caterpillar No. 955 Traxcavator*. "We believe this is the best all-around utility machine a city can own," says Supt. N. L. McCrory. "We've used it as a stump puller, a 'dozer, and an earth loader. It's easily moved from one location to another. And it's always ready to go to work."

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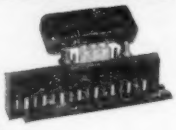

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is broken up into zones and it is better to have too many zones than too few. A survey station should be established at every main highway entering the city and carrying volumes of at least 500 vehicles per day. The O & D survey should be planned for a Tuesday or a Thursday in August during the 6 am-6 pm or 7 am-7 pm daylight hours, depending on which period includes the heavy morning and evening peaks. The questionnaire postal card method can be designed to suit local needs, containing as few as 2 questions or as many more as desired. After the tabulation of the questions the O & D data are plotted using an 18" x 24" base, and a scale of 3000 to 4000 vehicles per inch for volumes up to 5000 in a 12-hour period, the travel desire bands can be drawn to show the destination of traffic entering the city through each survey station. A second plate will show travel on the bases of zones, rather than points of entry.

"Highway Planning For the Small Town—The Traffic Story." By Jacob Mende. PUBLIC WORKS, June.

City Services Are Decentralized

There are four service centers located well out on the outskirts of the City of Dallas. Headquarters for all operations is at the Southeast Center, where there are four main buildings on 25 acres of land. Each of the other centers is a miniature of this headquarters plan. All are one-story, on paved areas with a railway siding into each one. Filling stations, with accessory services, are provided at each center. On 25 acres each, the centers can expand for years to come. About 1500 persons are employed at the headquarters building and about 500 people are employed at each of the smaller centers. The headquarters shop is equipped to rebuild trucks and machines of all kinds. There are body and paint departments, and heavy welding and fabricating of any kind can be done. A machine shop has lathes and drill presses and a traveling electric crane traverses the entire length of the building. At one of the smaller centers, for example, there are 9 stalls in a row for work on trucks and two stalls for washing. Six mechanics are on duty from noon until 10:30 at night. A $100,000 inventory of supplies and parts is carried at the headquarters. These are fed out to the other centers in a simplified procedure in which orders are automatically checked in and out of the master inventory. The over-all

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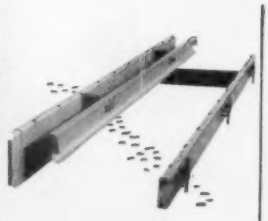
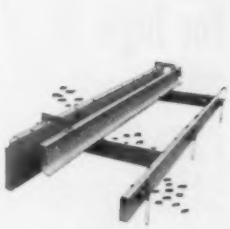
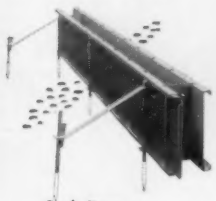
The forms shown at right are but a few of the many types available—for complete information see Bulletin 2259-R. Your nearest dealer has it or you can write direct to Blaw-Knox for it.



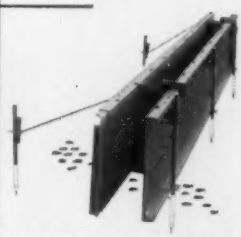
Curb and Gutter Forms



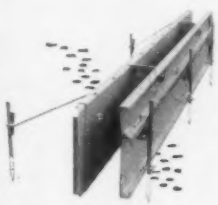
Curb and Gutter Forms



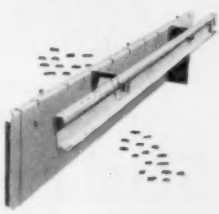
Curb Forms, vertical back and face



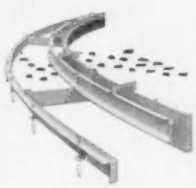
Curb Forms vertical back with battered face



Curb Forms, battered exposed face



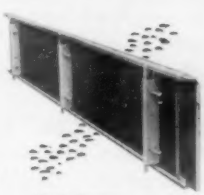
Integral Curb Forms



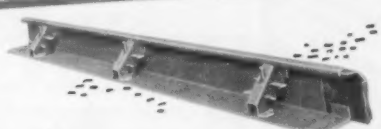
Fixed Radius Forms

Flexible Radius Forms

Sidewalk Forms



Curb Forms



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Self-aligning road forms save time and materials on highway and airport paving, too. They will assure rapid form setting that is always true to line and grade. Road forms are available in heights of 6" or more and Airport forms in heights of 12" or more.

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CONSTRUCTION EQUIPMENT DIVISION

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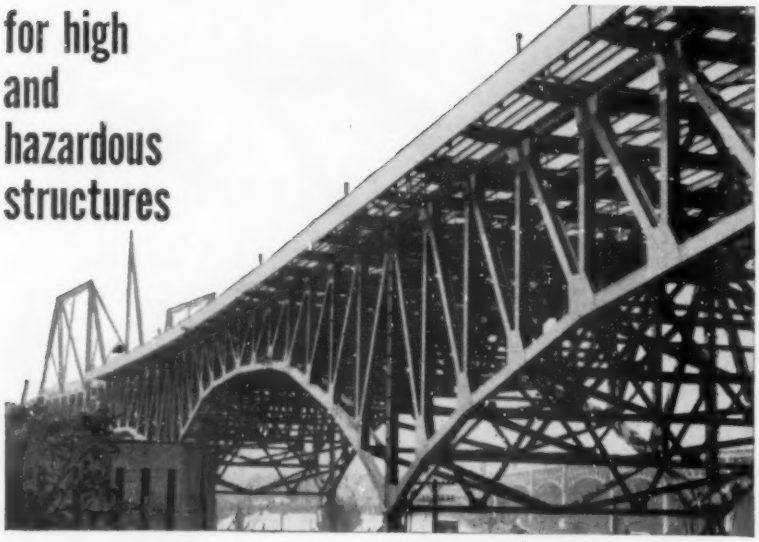
for high and hazardous structures

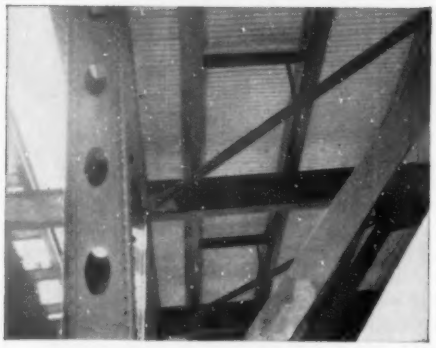


Leave-in-Place

Steel Forms

for

concrete bridge decking



USF galvanized Steel Forms provide the industry's most practical solution for laying concrete bridge decking where removal of conventional forms would involve hazardous and expensive operations. All installation is completed from top side without special tools or equipment. They are *left in place* after concrete is poured, eliminating entirely costly erection and removal of shoring, catwalks and wood forms. The USF Steel Form is specifically engineered for this service, with more than adequate capacity to support the required amount of wet concrete.

Send for illustrated data sheet.

UNITED STEEL FABRICATORS, INC.

WOOSTER, OHIO

PRODUCTS

Hollow Metal Doors • Prefabricated Metal Buildings • Window Wells • Highway Guard Rail • Bridge Flooring • Steel Forms for Concrete Bridge Floors • Corrugated Metal Pipe • Sectional Plate Pipe and Pipe Arches

effect of the new centers on the morale of the organizations is evident everywhere. Pleasant environment is one of the satisfactions sought by discontented employees in almost every labor dispute and they have it here.

"City Services are Decentralized—Better Operations Result." By Guy Browning Arthur. PUBLIC WORKS, June.

Roadside Weed Control Program

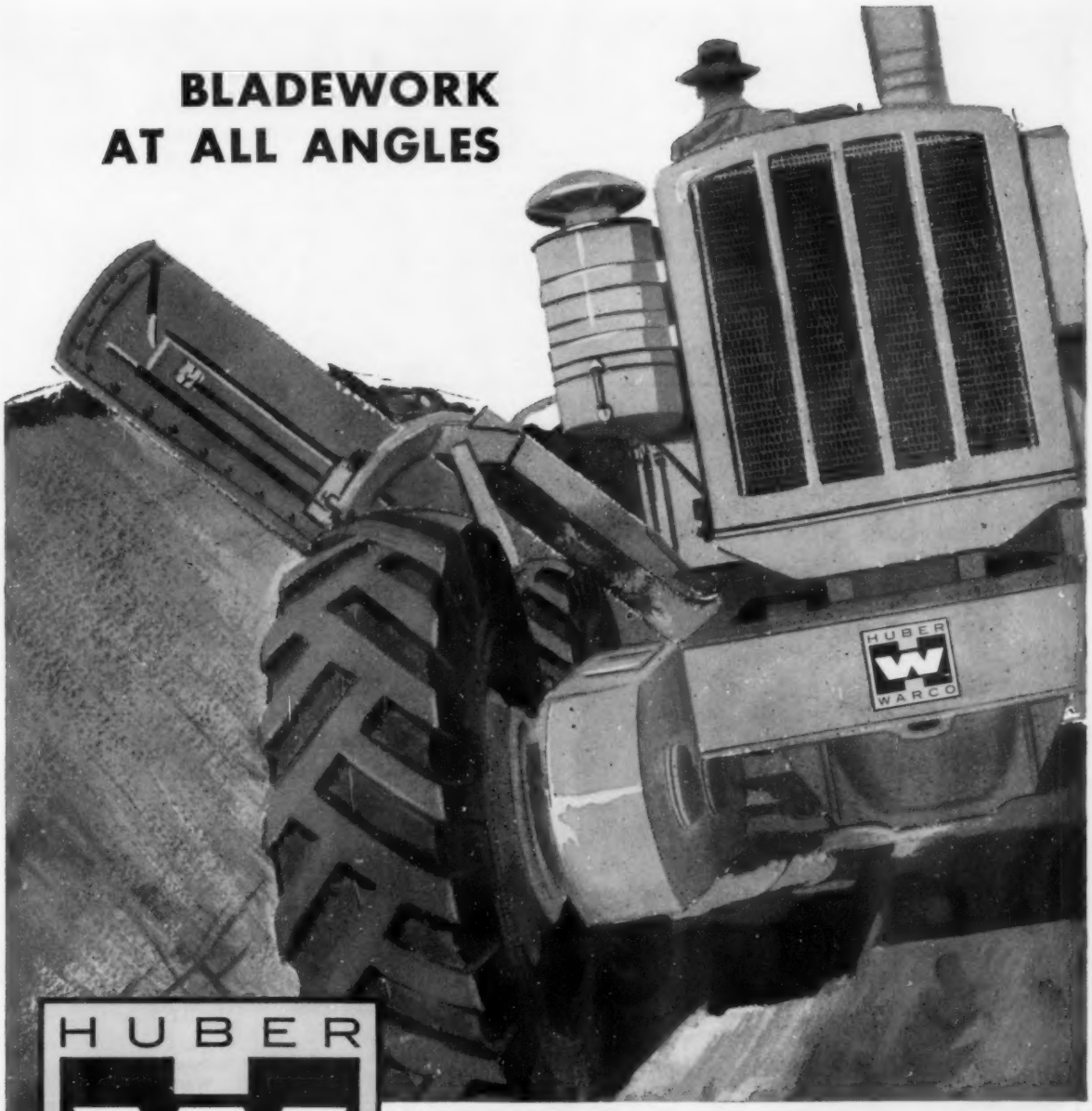
Roadside spraying is a part of the Woodbury County, Iowa, program to eliminate noxious weeds. For brush foliage spray, a mixture of 2 lbs. of 2,4-D and 2 lbs. of 2,4,5-T per gal. in 100 gallons of water, is used. Part #2 fuel oil in place of water seems to give better penetration and slower evaporation. Through the use of 2,4-D and 2,4,5-T, it is now possible to kill trees and brush by spraying during the winter months. In stump control 1 pint of the mixture of 2,4-D and 2,4,5-T in 10 quarts of fuel oil is used with the mixture applied by using a 3-gal. shoulder spray. In basal treatment the chemical mixture is sprayed all around the base of the tree from the ground up to 2 ft. and the bark is soaked thoroughly until the chemical runs into the ground. For most of the spraying work an Oliver high pressure 3-piston pump with a 10-gal. per min. capacity is used. It quickly regulates from 20 lbs. up to 250 lbs.

"Roadside Weed Control Program". By L. A. Westfall, Woodbury County Weed Commissioner. PUBLIC WORKS, June.

Special Finisher Meets Tight Tolerances

Concrete was placed and finished to the full 24-ft., 2-lane width on a resurfacing job in California. The highway specifications were met by a special contractor-developed, long-wheelbase finisher. The 8-in. slab was added by pinning steel side forms to the edges of the old paving, and placing concrete directly on it. The paving train included a spreader that tamped and kneaded the mix for initial finishing and a 24-ft. wide mechanical finisher. The finisher has a series of steel-clad timbers arranged in a herringbone pattern. It spans the 24 ft. between the steel side forms and is 20 ft. long. Self-propelled, the unit makes several passes after the concrete is nearly set to level off the inequalities. The boards on the float are so arranged that they can be adjusted to make a plane section or a crowned sec-

BLADEWORK AT ALL ANGLES



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HUBER-WARCO MOTOR GRADERS

Whether the job calls for bank-sloping, back-up pass or just moving the blade out a little farther to pick up a windrow . . . there's no problem. Any desired blade position is possible on the Huber-Warco motor graders, and each position is hydraulically controlled from the cab through the exclusive saddle design and power-sliding moldboard. There are no manual adjustments to be made. There are 10 standard transmission and torque converter models available ranging from 75 to 195 h.p. See your nearest Huber-Warco distributor for details.

HUBER-WARCO COMPANY
MARION, OHIO

tion. A short board on the front of the float near the center can be adjusted to throw the windrow of accumulated mortar to either side. A separate, independently mounted board on each 12-ft. half of the rig is used as the strike-off board in making the final pass.

"Special Finisher Meets Tight Tolerances." *Engineering News-Record*, April 25.

Dust Control Aids Street Maintenance

Many of the secondary roads are constructed of crushed oyster shells in Tampa, Fla. The material does much to stabilize the soil and serves as a good base course, but the crushed shells do become dusty when dry. It was decided to use a 94 to 97 percent calcium chloride pellet in the dust maintenance of these roads. The work consisted of first shaping the road surface with a grader and then watering and rolling with a rubber-tired compaction roller. The pellet was added with a lime-drill-type spreader towed by a truck. The application rate was 1.2 pounds per sq. yard.

"Dust Control Aids Street Maintenance." By Roy K. Van Camp, Supt. of Public Works, Tampa, Fla. *American City*, May.

Vertical Drains For Road Frost Control

Holes 2 ins. in diameter are being drilled into pavements and filled with rock salt in Boone County, Illinois, for road frost control. The salt thaws the water underneath the pavement and the holes relieve the trapped water. Experiments have been conducted on 3 roads by drilling along the edges of the blacktop throughout their length with holes placed 5 and 10 ft. apart. There has been no edge checking and the holes are draining water winter and summer.

"Salt-Filled Vertical Drains For Highway Improvement." By Neal H Frank, Davis Sand & Gravel Co., Belvidere, Ill. PUBLIC WORKS, June.

Other Articles

"Estimating For **Annual Maintenance.**" Estimates are prepared for the large annual program of highway maintenance carried out by the County Surveyor's Dept. By A. S. Turner, Deputy County Surveyor of Somerset. Contractors Record and Municipal Engineering, April 17.

"Modern Conceptions in the **Planning of Bridges** in Reinforced Concrete and in Prestressed Concrete." By Dr. Ing. Riccards Morandi. Roads and Road Construction, April.

"Use of **Pressure-Treated Timber** For County Bridges." By W. A. Stacy, District Engineer, American Wood Preservers Association. Roads and Engineering Construction, March.

"We Put an End to **Patching** Headaches" by having a truck-mounted paver. By Wynn Priday, Director of Public Works, Anaheim, Calif. American City, May.

"Special Truck Cuts Cook County's **Pavement Striping** Costs." By Phil Hirsh. Public Works, June.

"Mix Design For Special Purposes." Concrete mix design and quality control. By B. W. Shacklock, Cement and Concrete Association. Contractors Record and Municipal Engineering, April 24.

"Flexible Road Construction Using Low Grade Materials." The Surveyor, April 27.

"Dip Drainage Fading From Western Scene." By L. D. Wilson, Chief Engineer, New Mexico Highway Dept. Highway Magazine, May.

"The **Slip-Form Paver.**" By A. B. Middleton, Senior Resident Engineer, District 20, Texas Highway Dept. Texas Highways, March.

"Detailed **"Design Procedure** For a Prestressed, Pre-Tensioned, Bonded Concrete Modified I-Beam and Composite Girder." Prepared by V. J. Brown, C. E., from data by H. Kent Preston, John A. Roebling's Sons Corp. Roads and Streets, May.

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MODEL 55 *Tandem Roller*

1½ to 2½ TONS

for ECONOMY... SPEED

BUILT LIKE THE BIG ONES

PERFORMS LIKE THE BIG ONES

Provides FLUSH CURB Rolling on Each Side

THE MODEL 55 ROLLER was designed to provide two important advantages: (1) Adequate compaction for patch rolling requirements and (2) Ideal roll dimensions for smoothing and finishing work. Ballasting is evenly distributed through the use of both steel and water ballast. Steel ballast is removable in 70# sections providing a wide choice of compaction ranges.

The Model 55 will roll to within 2 inches of wall or building on driver's side and to 4½ inches on opposite side. Eight inch ground clearance provides flush rolling adjacent to curbings. Automotive steering makes easy driving. Upholstered seat, safety seat rail, speed control, throttle and foot brake are of motor-car type — and water valve is in easy reach of operator. The maximum weight with all ballast is 4600#. Shipping weight is 3600#. Speed — from 1.75 MPH to 3.5 MPH

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Photo above shows ease with which roller is loaded and unloaded from trailer. One man can easily lift and hook it to towing vehicle

Loading Ramp becomes end gate. Roller locks on trailer for safe travel at all speeds. Write for FREE Catalog and Prices

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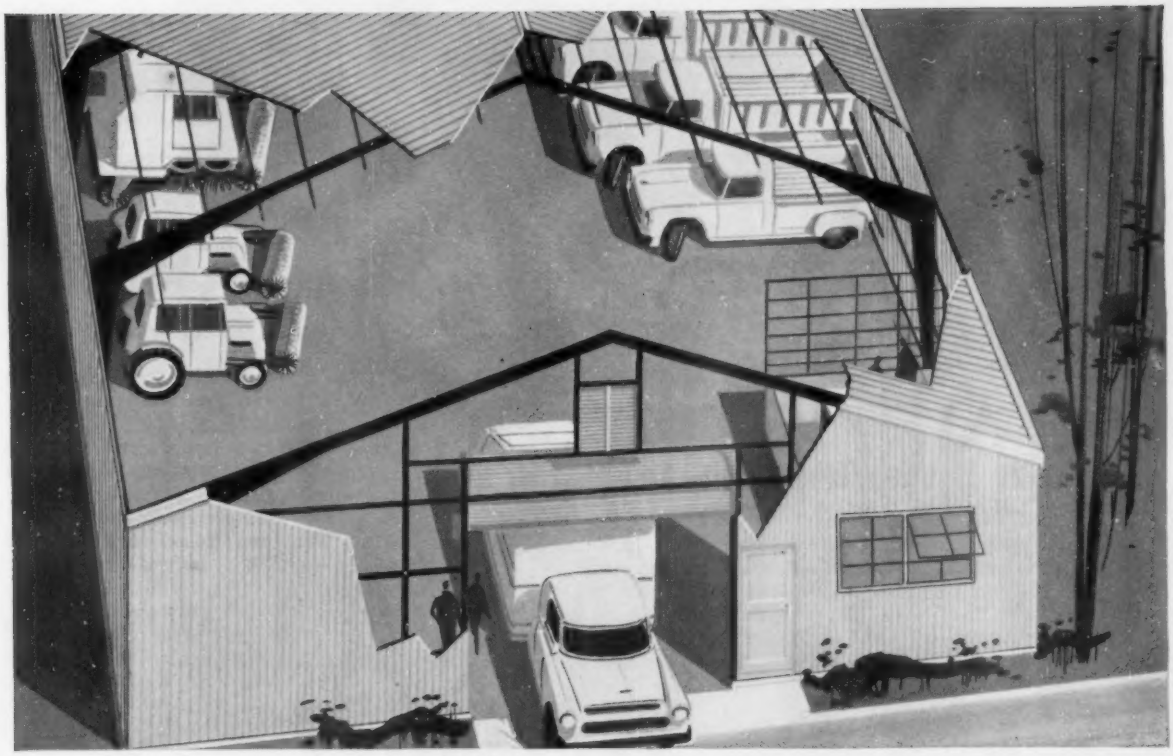
R-1

Standard Steel Works, Inc. NORTH KANSAS CITY, MO



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Sturdy Tapered Frame Design Puts Strength Where Needed

The sturdy design of Stran-Steel buildings makes them hardworking and durable for public works, rail and utility shops, maintenance-repair operations and municipal or institutional vehicle garages. In addition, new Stran-Steel buildings have a look of quality never before achieved in an all-steel structure.

Start with the smart *Stran-Satin* finish. *Stran-Satin* metal wall, exclusive with Stran-Steel, provides a strong, durable exterior with the weather resistance of zinc-coated steel and the smooth spangle-free look of expensive materials. Peaks, gables and eaves are completely enclosed with smart fascia flashing.

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● CENTRAL section of the demonstration streets designed for lighting tests.

Roadway Lighting Test Facility Unveiled by GE

A HIGHLIGHT of the 1957 Street and Highway Lighting Conference sponsored by General Electric's Outdoor Lighting Department at Asheville - Hendersonville, North Carolina was the formal unveiling of demonstration streets which provide virtually every combination of modern lighting for roadways. The area is designed to offer practical demonstrations of all three major light sources — filament, mercury and fluorescent — on residential streets, traffic streets, main business streets and whiteways. Different types of pavement and varying widths are incorporated in this "K" shaped layout, which permits the visitor to compare all the lighting combinations from a single station. More than 130 luminaires of 15 different types are mounted on steel, aluminum, concrete and wood poles with a variety of brackets. Included in the demonstration area is a 100-foot stretch of parallel-to-roadway fluorescent street lighting, an experimental new system.

The three-day conference was attended by 200 representatives of municipalities, state and county highway departments, public utilities and others interested in progressive roadway lighting. A keynote address was presented by Joseph Barnett, Deputy Assistant Commissioner, Bureau of Public Roads, who spoke on "The Federal-Aid Highway Program." Features of all types of lighting apparatus were discussed by General Electric personnel in the highly informative conference sessions, and the program included a tour of GE's new plant facilities at Hendersonville.

Three Water Users Construct Joint Pipe Line

CONSIDERABLE savings in providing for current and future water needs have been effected by the City of Pomona, the Walnut Valley Water District, and the Rowland Area Municipal Water District in Southern California, by constructing a joint water line. All three general areas had made studies of supplemental water supplies. Not only was the same source indicated for all, but the general courses for their water lines would be the same. By cooperative effort, the three agencies were able to reduce the need for right of way to a minimum and construct one water line instead of three.

Combined as the Pomona-Walnut-Rowland Joint Water Line Commission, it was first necessary to obtain favorable action by the Legislature. Then the Commission decided to file a test court case to preclude future legal objections to the project and to establish the Commission as a financially responsible agency and legal entity.

Work began last October and the line, 6.9 miles long, is scheduled for completion this summer.

The design capacity of the PWR Joint Water Line is 141 second feet at the upper end, which is sufficient to meet the full requirements of Pomona and Walnut and one-half of Rowland. It is of 60, 54, and 42-inch diameter pipe and is designed for remote operation.

With initial water demands on the line only 10 percent of the ultimate, a specially designed flow meter installation with five to ten times the usual range of metering capacity was necessary. Additional meters will be needed as flow requirements increase.

The Pomona - Walnut - Rowland Joint Water Line can fill the water requirements of a half million population and will cost a total of $1,800,000. The three cities will share the initial cost on a proportionate capacity use basis with all three agencies sharing the cost of the 54 to 60-inch portion and Walnut and Rowland sharing the cost of the balance of smaller diameter line.

By combining their efforts and building only one water line instead of three, an immediate savings of approximately $156,000 will result, in addition to important long range savings in operation and maintenance. Pomona originally had designed a 39-inch diameter line for its own use. However, by sharing the cost of that part of the joint line consisting of 54 and 60-inch concrete pipe, Pomona will obtain 250 percent more flow capacity for only 50 percent more cost. Pipe for the job was furnished by United Concrete Pipe Corporation.

The Joint Water Line Commission, under Administrative Officer Everett A. Phillips, Manager and Chief Engineer of the Pomona Water Department, will act as a transportation agency, owning the joint water line in trust. The Commission will purchase MWD water from the Pomona Valley Municipal Water District.

● INSPECTION party checks work on the Pomona-Walnut-Rowland water line.

The engineering firms of James M. Montgomery, Pasadena, representing Pomona; Perliter & Soring, Los Angeles, representing Walnut; and Frank E. Alderman, South Pasadena, representing Rowland; worked together as a committee to standardize specifications.

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NEW Heavy Duty V-8 engines now have 4-barrel carburetion standard. Fresh-air intake with new thermostatic control optional on 302 and 332 V-8 engines. Dual exhausts also available.

NEW Styleside pickup bodies, standard at no extra cost. America's biggest pickup bodies! Built wider with all-steel rugged box section corner reinforcements and recessed taillights.

NEW riding comfort! Smarter, roomier Driverized cabs and completely new chassis suspension with rubber-cushioned springs provide greatly improved riding comfort and handling ease.

NEW power advances! New higher horsepower, new freer breathing, new higher compression ratios, new Super-Filter air cleaner. New advancements from camshafts to carburetors.

NEW automatic transmission for Medium and Heavy Duty trucks! Transmatic Drive ends the strain of constant shifting . . . torque-converter and six forward speeds automatically provide correct application of power. Fordomatic Drive is available for Light Duty models.

NEW chassis strength! New frames, up to 13% stronger. New sturdier springs and axles!

FORD TRUCKS COST LESS

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more FORD TRUCKS than any other make!

New Tilt Cab line offers six series ranging from 18,000-lb. GVW to 60,000-lb. GCW. Now, all the advantages of "cab forward" compactness, plus better engine accessibility and bigger payload capacity.

Why? . . . because on-the-job performance and low operating costs prove FORD trucks cost less!

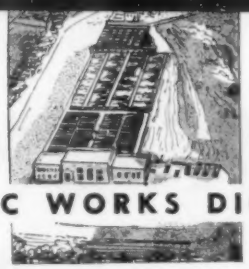
Take a tip from the men who buy trucks every year. Official truck registration data shows that owners of America's biggest commercial truck fleets are buying more Ford trucks than any other make!

Municipalities, large and small, have found Ford trucks are best for their fleets, too. To begin with, Ford's initial costs are low. Many models are priced below all competitive makes. For example, the new Ford Tilt Cab models are America's lowest-priced!*

And it costs less to run a Ford truck! Thanks to modern Short Stroke power and sturdy chassis construction, operating costs and "shop time" are reduced. Another important Ford plus is longer truck life—a fact certified by independent insurance experts.

Add it all up—you'll find Ford trucks do cost less! Contact your Ford Dealer . . . let him show you why the big fleets are buying more Ford trucks than any other make.

**Based on comparison of manufacturers' suggested retail prices*



PUBLIC WORKS DIGESTS

Prepared by
ALVIN R. JACOBSON, Ph.D.
Associate Professor and Head,
Division of Sanitary Science,
Columbia University School of Public Health

THE SEWERAGE AND REFUSE DIGEST

Refuse Collection Cost Cut—Service Improved

Hartford, Conn., has increased its refuse collection service and reduced per ton costs for disposal, despite higher operating costs and wages. Hartford has a population of 183,000 and in the 1955-56 period, refuse collections ranged from 160 to 250 tons per day. For collection purposes, there are four collection routes, each with a foreman in charge. Each route is normally organized into four truck crews with a driver and five men working directly with the truck, bringing out the filled containers and returning them. The 16 new 20-yd. packer trucks average over 9,000 lbs. of combustible refuse per load, or 27,000 to 30,000 lbs. per day, or over 5,000 lbs. per man per day. In the 1954-55 period, the cost of refuse collection per ton, including truck operation, maintenance, insurance and depreciation, was $10.72. In 1955-56, it was $9.66 per ton. Costs for the 1956-57 period are not yet available; but it is believed that the overall cost will again be decreased.

"Refuse Collection Cost Cut—Service Improved." PUBLIC WORKS, June.

Louisville Sewage Facilities Under Construction

Fulfillment of an urgent need for improved sewage disposal facilities is now well on the way to realization in Louisville, Ky. Construction of a $6,000,000 primary treatment plant was begun in the spring of 1956 and will be completed by 1959. A part of the plant's operations will be coordinated with the work of a $4,600,000 garbage and trash incinerator also now under construction. It is a good example of the application of modern engineering to the sanitation needs of a growing metropolitan community. Existing sewers were incorporated into the new system, which is synchronized with flood control. Money was made available by proper planning and intensive interpretation to the public. Partial liquidation of operating costs is expected to be accomplished through the sale of byproducts, such as cans, and other metal processed for scrap, and of dry sludge for fertilizer.

"Louisville Sewage Facilities Under Construction." By LaRue Spiker, *Water and Sewage Works*, May.

Miami's New Activated Sludge Plant

The City of Miami is operating its $27,000,000 sewage disposal project. Some 16 miles of intercepting sewers, two large and four small sewage pumping stations, three miles of 72-inch force main under Biscayne Bay, a 47-mgd high-rate activated sludge treatment plant, and an outfall sewer extending 4,600 feet into the Atlantic Ocean comprise the main features of the project. The sewage treatment plant is of the high-rate activated sludge type, with a design capacity of 47 mgd. In general, the plant is of conventional design, well planned and attractive in appearance.

"Miami Is Operating Its $27 Million High-Rate Activated Sludge System." By Garrett Sloan, *Wastes Engineering*, May.

Safe Limits for Treating Metal Wastes with Sewage

The subject of metal plating wastes in sewage and their effects on treatment is a complex one. The

Landfill Operations Provide Four New Playgrounds

BY REPLACING outdated disposal operations with a modern sanitary landfill system, Richmond, Virginia has reclaimed formerly worthless tracts of land and provided four new playgrounds for the city's youth. To date, 37 acres have been converted into useful recreation areas. The landfill reclamation project started in 1948.

The accompanying photo shows one of the four International Drott Skid-Shovels used for the project at work on a 20-acre abandoned gravel pit. Two other TD-14 Skid-Shovels are in use, in addition to the one shown, and there is one TD-18 with a 3 cu. yd. bucket. These units work at six locations in the city, providing disposal of garbage and rubbish for 250,000 persons within a 39.75 sq. mile area. The machines help spread, compact and cover a million cubic yards of refuse each year at a cost of only 13¢ per compacted cubic yard.

Great grandmother used hidden reinforcement to restrain her figure; Lock Joint prestressed pipe design uses much the same principle to restrain the high internal pressures in present day water transmission lines. Lock Joint's hidden reinforcement consists of high tensile wire wrapped under high uniform tension around the core of the pipe.

Can you guess how many miles of such wire were used in the 120,000-foot 66″ Lock Joint Prestressed Concrete Embedded Cylinder Pipeline for Wichita's water supply system? The answer will be found—not too carefully hidden—in the picture above.

Samples of all such high tensile wire used in the production of Lock Joint prestressed pipe not only are certified by mill tests, but also must meet the exacting standards demanded by rigorous tests to which they are subjected in Lock Joint's own laboratory. This is only one of the many quality control measures employed in every phase of the manufacture of Lock Joint Pressure Pipe to assure the customer the finest product obtainable.

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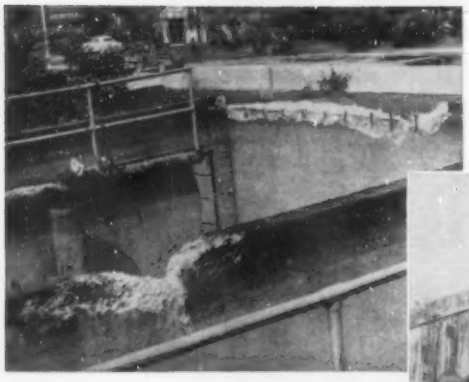
THOROSEAL *Restored* this Filtration Plant



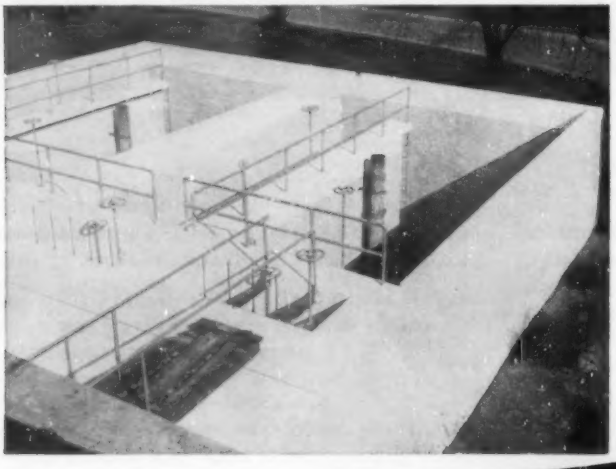
BEFORE

Example of complete break-down of masonry, due to penetration of water into body of concrete and action of frost in damp masonry.

It is amazing how THORO System products will correct a condition, such as shown in photograph. Concrete was sandblasted to remove all disintegrated material to sound concrete surface and reinforcing rods. Patching was done with THORITE Patching Mortar, bringing blistered areas to true and even lines, followed by two applications of WHITE THOROSEAL for protection.

AFTER

At minimum cost, almost ⅓ the cost of other methods, concrete restoration, patching and surface protection was completed with THORO System products on Filtration Plant in Keyser, West Virginia. Contractor: Standard Construction & Waterproofing Company, of Cumberland, Maryland.



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NEW EAGLE, PENNSYLVANIA

wastes include oils and greases, detergents, acids and alkalies, cyanides and other less toxic radicals, a dozen or more metals with varying degrees of toxicity, and an almost infinite variety of patented additive compounds of secret composition. Their rate of discharge from the plating plant is highly irregular both in flow and in combinations and concentrations of constituents. The biological effects of each of the toxic constituents can vary widely. Toxicity may be influenced by the chemical composition of the toxic material, its capacity for ionization, the pH of the solution, the synergistic effects of other constituents, and the degree of acclimatization of biological forms to the material. The author has given some of the possibilities; undoubtedly there are others, of sewage treatment plant design that might make it easier for the operator to combat occasional adverse effects of plating wastes. Each problem must be evaluated individually.

"What Are Safe Limits for Treating Metal Plating Wastes with Sewage?" By F. W. Kittrell, *Wastes Engineering*, May.

Primary Treatment Plant And Holding Ponds

Sunnyvale, Calif., in 1954, entered into a contract for the design of a primary treatment plant for domestic sewage and holding ponds for the strong cannery wastes from the canneries located within the city. The treatment plant was put into operation in 1956 and construction of the holding ponds, now being designed, will take place within the next 18 months or two years. The plant design permits a doubling of capacity at minimum cost to meet future growth. An interesting feature of this plant is the separate by-pass lines which permit the industrial waste to be sent through the plant or around it to the holding ponds and also permits the sanitary sewage to by-pass the plant in case of emergency or extremely heavy storm flows. Piping arrangements permit sewage to by-pass or to be pumped to either of the aeration and sedimentation tanks. Chemical treatment consists of provisions for the addition of chlorine to the raw sewage ahead of the screens and of sodium nitrate to the industrial waste or domestic sewage or both. Digested sludge flows by gravity from the digesters to two sludge lagoons.

"Double Will Be No Trouble." By Kenneth W. Brown. *The American City*, May.

Latest additions to the Darien, Connecticut, plant include a new digester (left), and P.F.T.—Pearth equipment on the existing cover. Design of plant by: Bogert & Childs, Consulting Engineers, New York City.

Plant expands, and P.F.T. equipment is selected for the third time

For the third time, Darien, Connecticut, has selected P.F.T. equipment for digester additions and improvements. This city knows there is no substitute for well engineered, thoroughly dependable equipment.

P.F.T. supplied dosing siphons in 1927, floating cover and gas safety equipment in 1939, and now a Gas Holder Cover for the new 30-foot digester. A complete P.F.T.—Pearth Gas Recirculation System was also installed on the existing 30-foot cover. Now scum conditions are closely controlled, and the entire tank can be used for active sludge digestion.

In addition to floating cover, gas holder, and Pearth system, the plant includes a gas-oil fired P.F.T. #100 Sludge Heater, and a complete complement of Gas Control Equipment.

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Tuberculosis Transmission By Waste Waters

From a review of the literature on sewage, tubercle bacilli, and tuberculosis as a clinical disease, it is apparent that health hazards may exist in the disposal of tuberculosis material. An attempt was made to answer several questions regarding tuberculosis and sewage. The following conclusions appear justified: 1) The wastes from institutions treating tuberculosis patients will almost always contain large numbers of tubercle bacilli; 2) Industries, such as dairies and slaughter houses, handling tuberculous animals, may be expected to discharge tubercle bacilli with their wastes; 3) Conventional sewage treatment is inadequate to reduce significantly the number of tubercle bacilli in the sewage, complete treatment plus chlorination at 20 ppm for 2 hrs. being required; 4) Contaminated sewage or water can produce typical tuberculosis in humans, the danger being most marked with swimming and near-drowning, but the danger associated with other uses should not be minimized nor neglected.

"Tuberculosis Transmission by Waste Waters—a Review." By Arnold E. Greenberg and Edward Kupka. *Sewage and Industrial Wastes*, May.

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County-Wide Planning Of Sewage Treatment

Harris County, Texas, has had a phenomenal population growth since World War II as many other cities, having increased by 607,000 persons or 115 percent from 1940 to the end of 1956. Past experience had shown that pit privies and septic tanks were unsatisfactory methods of sewage disposal. With the cooperation of the subdividers and home builders, public sewerage systems meeting the State Board of Health requirements were installed to serve entire subdivisions and the era of individual sewage disposal for large subdivisions ended. The degree of cooperation of the subdividers and the success of the program is shown by the fact that from 1945 to the end of 1956, 97 sewage treatment plants were constructed in Harris County. These plants range in design population from 90 to 42,000. Of these plants, 80 percent have a design population of 5,000 persons or less, and 40 percent have a design population of 2,000 persons or less. The article also discusses the problems of operation as well as other problems.

"County-Wide Planning of Sewage Treatment." By Roger Moehlman, Philip W. Young, and Meryl L. Olson. PUBLIC WORKS, June.

Other Articles

"Ten Years Operation and Development at **Luton (England)** Sewage Treatment Works." By S. C. Evans. Water and Sewage Works, May.

"Synthetic Detergents—A New Pollution Problem". By B. A. Southgate. Water and Water Engineering, April.

"New Jersey Sewerage Authority Solves **Industrial Waste Problem."** By Charles Saunders. The American City, May.

"Miami High-Rate Activated Sludge Plant In Operation." By E. Sherman Chase and John S. Bethel. Civil Engineering, May.

"Coping With **Suburban Sewage Disposal."** This is the third article in a series and it discusses legislation and financing. By J. A. Salvato. Modern Sanitation, April.

"A Study of **Sewage Treatment Efficiencies."** By W. L. Ogden. Public Works, June.

"Biofilters with **Corrugated Metal Walls."** By Harry N. Jenks. Public Works, June.

"Photogrammetry Speeds Completion of Trunk Sewer Line". By Kenneth A. Thompson. Public Works, June.

"**1956 Literature** Review." A review

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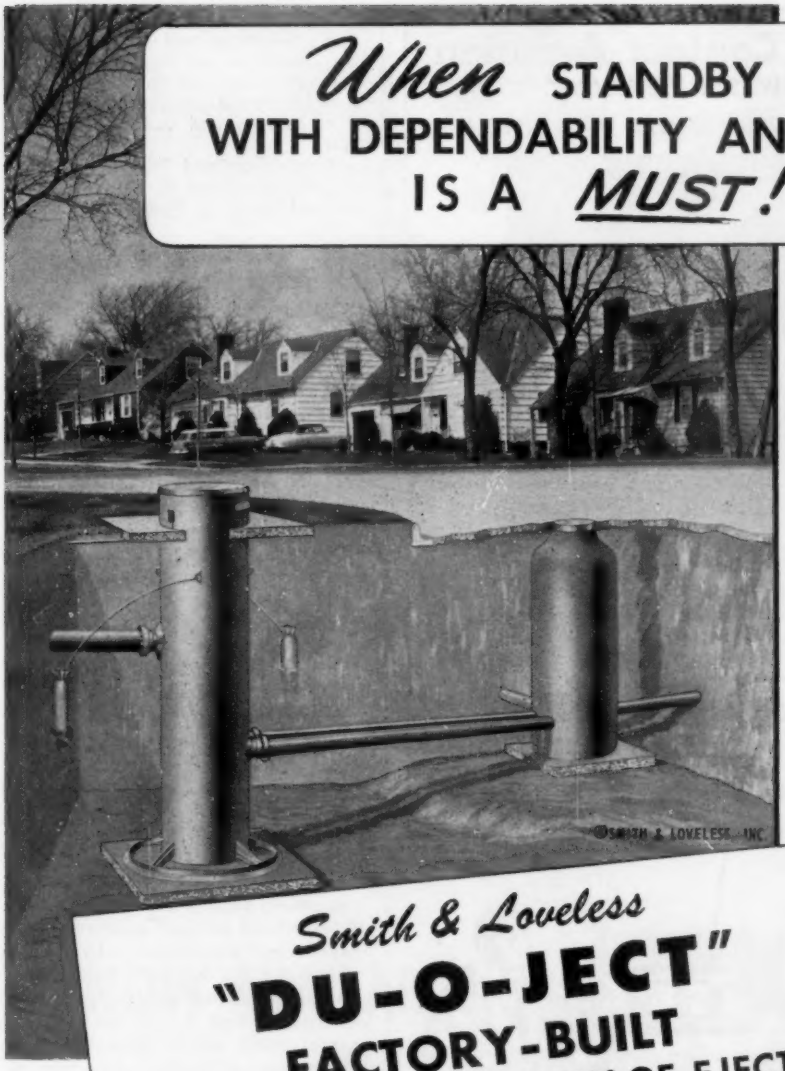

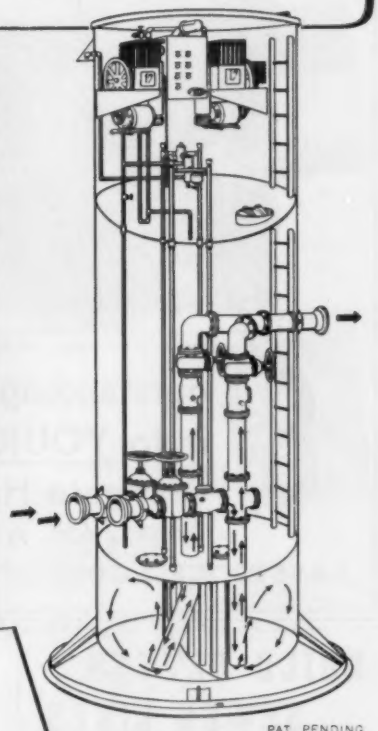

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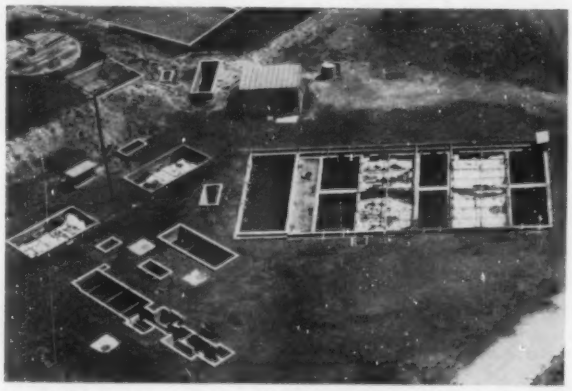

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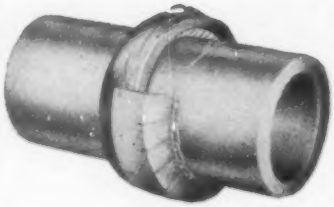

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of the literature of 1955 on sewage, waste treatment, and water pollution. By Committee on Research, Federation of Sewage and Industrial Wastes Associations. H. Heukelekian, Chairman. Sewage and Industrial Wastes, May.

"Biota Associated With **Sewage Filtration.**" By Albert E. Feldman. Sewage and Industrial Wastes, May.

• • •

Sewage Sterilization by Irradiation

Preliminary experimental studies indicate that sterilization of sewage or waste by irradiation is feasible, the Department of the Army has announced. More research and development, however, will be necessary if the process is to be used on a large scale. The studies, carried out by the Armour Research Foundation, Chicago, under a contract with the Army Chemical Corps Biological Warfare Laboratories at Fort Detrick, Frederick, Md., consisted of a technical and economical evaluation of the potentialities of sterlizing waste materials in both small and large quantities.

It was concluded that a nuclear reactor might be used to sterilize sewage for as little as one-quarter of a cent per gallon. At the same time, the reactor could be used as a source of heat or electrical energy. Waste would be used as a secondary coolant and would pass between the reactor and the thermal shield rather than through the reactor core. This conclusion was based on experimental work which showed that a suspension of a virus and one of bacterial spores were completely sterilized by isotope irradiation (primarily gamma rays). About 2,000 times as much radiation is required to kill a bacterial spore as is fatal for a human.

Using the experimental technique, it would cost about 16 cents per gallon to sterilize sewage. The cost would be lowered to about 1.4 cents per gallon if irradiation from a nuclear reactor were used. By using the sewage as a secondary coolant for the reactor, and thus taking advantage of the available heat, the estimated cost might drop to one-quarter of a cent per gallon.

From work accomplished to date, it does not appear that waste sterilized by irradiation would be radioactive enough to present any public health menace. If these preliminary conclusions hold true, sterilization by irradiation might aid in solving stream and river pollution problems.

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If your specific problem is sludge or scum removal from rectangular tanks, the new Rex Bulletin 315-61 describes in detail the proved Rex Conveyor Sludge Collectors and Skimming Equipment which will do the job in the best possible way.

You or your engineers will find these two new bulletins helpful in selecting waste treatment equipment.

For data on other Rex products for waste and water treatment, detailed bulletins are available. These bulletins will help you select and specify the proper equipment for the job...equipment designed and built in the CHAIN Belt tradition of quality engineering and manufacture. Many of these bulletins include engineering and selection data.

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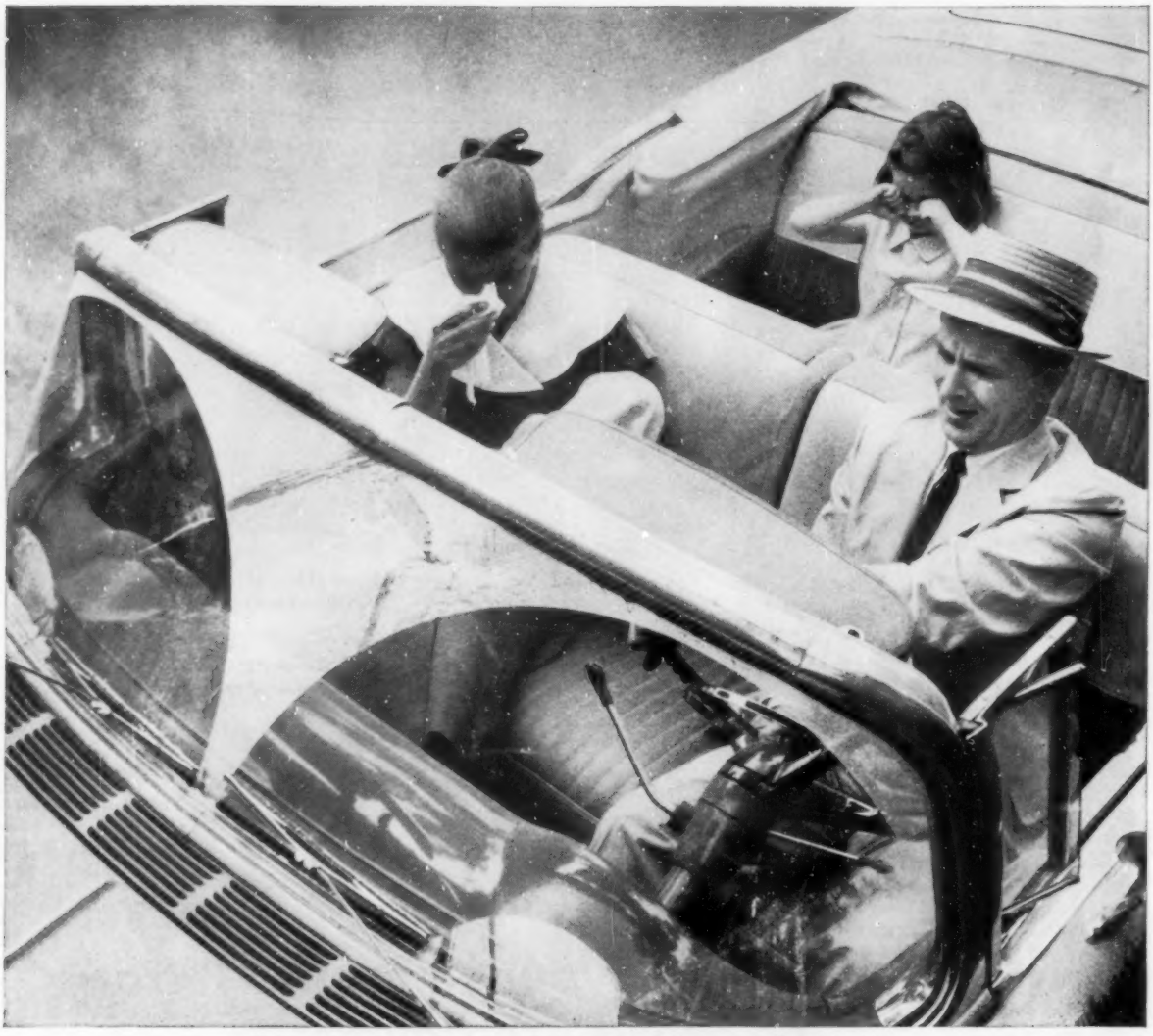

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Costs so little to save their comfort and goodwill

Columbia Calcium Chloride treatment ends irritations and danger from road dust

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Columbia Calcium Chloride is your best bet for stabilizing shoulders and improving detours, too. You're assured of safe, smooth, dustless driving conditions and decreased maintenance.

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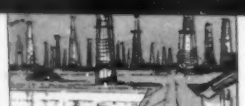

STANDBY POWER FOR SEWAGE PLANT

● PUBLIC WORKS Commissioner Nelson Conover, left, and Joseph Gilligan, Supt. of Sewers, at entrance of building housing standby generator set at sewage treatment plant serving Avon by the Sea, New Jersey.

● THIS Caterpillar D318 Diesel Electric Set at the Avon plant can handle two 1,000 gpm sewage pumps.

• • •

High Pressure Fire Pumping Gives Added Protection

A high pressure fire pumping station is maintained by Toledo, O., for providing fire protection to the downtown high-risk district. River water is pumped into a separate system of downtown mains. During 1956, there were 101 alarms which alerted the station, but in only two cases were there active calls for water. For one of these, 252,000 gallons were required; for the other 8,400 gallons. George Van Dorp is Chief Engineer of the Toledo Division of Water.

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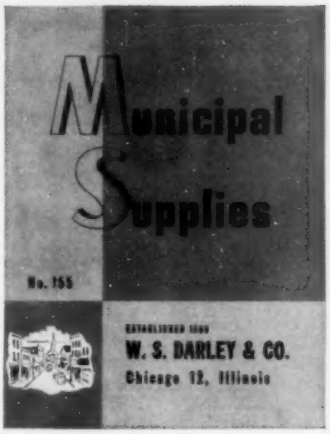

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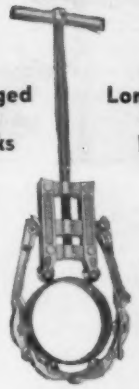

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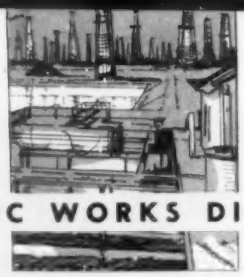


PUBLIC WORKS DIGESTS

Prepared by
CLAYTON H. BILLINGS
Associate Edtior

THE INDUSTRIAL WASTE DIGEST

Mixed Cultures Treat Sulfite Liquor

The use of mixed cultures in high-rate aerobic biological treatment of spent sulfite liquor in laboratory bench-scale and semi-pilot plant applications is reported. In the laboratory scale studies, raw ammonia-base spent sulfite liquor was aerated in the presence of bacterial cells under controlled temperature conditions. The bacteria were removed by settling and a portion were returned to the aeration chamber to maintain a constant concentration. The suspended solids concentration was varied between 10,000 and 32,000 ppm and high BOD reductions were obtained at all bacterial cell concentrations. Removal of sulfur dioxide from the waste was found to improve treatment results and effect savings in costs. The pilot plant investigations were accordingly undertaken using a sulfur dioxide stripping column for preliminary treatment of the sulfite liquor. The pilot plant aeration equipment included a turbine-type mixer and draft tube to prevent excessive foaming. Compressed air was admitted to the mixer and dispersed into the fermenting mixture composed of equivalent volumes of foam and liquid. The process was capable of reducing 80 to 90 percent of the BOD, using 20,000 to 30,000 ppm of suspended solids, and operating at BOD loadings in excess of 2 lbs. per cu. ft. per day.

"Aerobic Fermentation Studies of Spent Sulfite Liquor." By H. R. Amberg and J. F. Cormack, Crown Zellerbach Corp. *Sewage and Industrial Wastes*, May.

Spray Irrigation Of Canning Wastes

There has been a sharp increase in the use of spray irrigation for canning waste disposal, and its popularity is the result of complete avoidance of pollution problems and nuisance as well as potential land and ground water reclamation possibilities. Availability of land is a critical factor and many canners have combined spray irrigation and lagoon disposal to permit year around operation. The cover crop is important to keep the soil in a satisfactory receptive condition. Vibrating or rotary screens are used for preparing the waste, and a holding reservoir is employed to accommodate fluctuations in flow. Main lines can be of any standard pipe line material and laterals are frequently aluminum. Nozzle orifices of less than ¼ in. diameter tend to clog readily. The popularity of the method emphasizes the need for concerted studies on the adaptation of cover crops, fertilizing potentials, the irrigation of crops for human consumption, eliminating screening, application for wooded growth, and the possibility of chemical soil conditioning.

"Spray Irrigation for Disposal and Crop Growth." By R. A, Canham. *Industrial Wastes*, May-June.

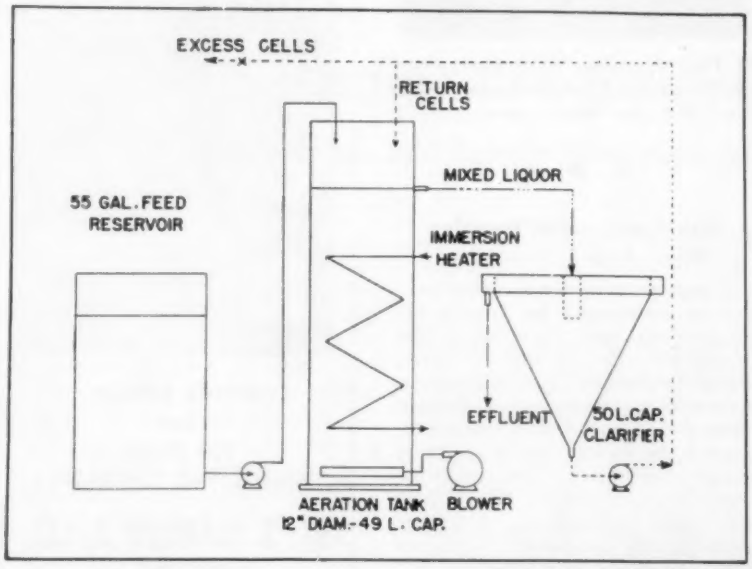
Complete Treatment For Refinery Wastes

To reduce the pollution load on the Mississippi, the Shell Oil Refinery at Wood River, Illinois, is constructing a $1.1 million complete treatment plant. The facilities will consist of a lift station, an aeration basin, oil separator, retention ponds and a trickling filter, designed for a 6 mgd flow. Waste characteristics expected to be reduced in value or eliminated include phenols, sulfides, oil, suspended solids, mercaptans, chemical oxygen demand and threshold odor. Control of pH will be carefully handled to prevent excessive stripping of hydrogen sulfide from the aeration process into the atmosphere and to promote oxidation of phenols in the trickling filter. The retention ponds will provide 24 hours' holding time for collection of oil missed in the separator, for surge capacity, and for solids removal and pH adjustment.

"Oil Refinery Spares the Mississippi Its Wastes." By G. S. Russell and F. E. Wenger, Russell and Axon, Consulting Engineers. *Engineering News-Record*, May 30.

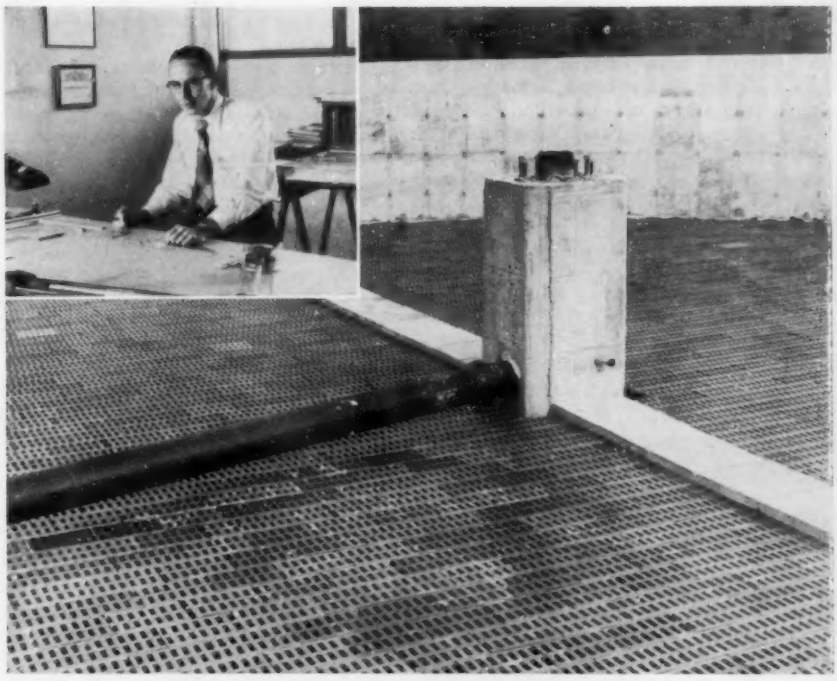
Designing for Plating Wastes

While there is fair agreement among authorities as to limitations



Courtesy Sewage & Industrial Wastes

● SCHEMATIC diagram of laboratory unit for aerobic fermentation of spent sulphite.



Vitrified clay trickling filter floor at Drumwright, Okla.

"EASE and SIMPLICITY of OPERATION"

is given by C. W. Pate (above) of Pate Engineering Company, Tulsa, Oklahoma, as "the main reason" for choosing

Trickling Filters at Drumwright, Okla.

As illustrated above, TFFI Specification vitrified clay bottom blocks were used. Other widely recognized advantages of the trickling filter with TFFI blocks are causing more and more leading consulting engineers to specify them. These are:

Low cost . . . Long life . . .
Good results . . . Reliability . . .
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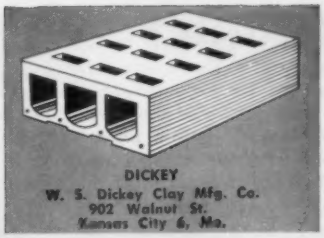
Circular primary collector by Walker Process Co. Sewage pumps by Aurora Pump Co. with Allis-Chalmers motors.

Designing engineers may address any manufacturer member listed in panel at right for HANDBOOK OF TRICKLING FILTER DESIGN—free

TFFI
Symbol of good treatment

TRICKLING FILTER FLOOR INSTITUTE



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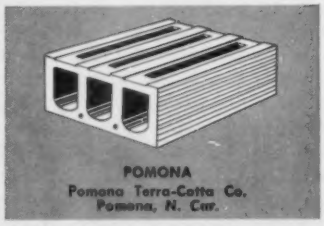

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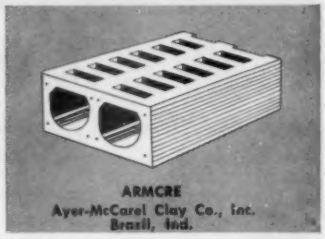
Pomona, N. Car.



ARMCRE
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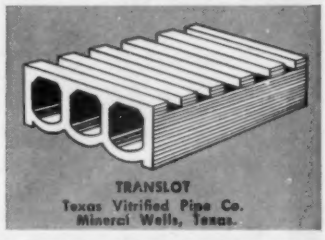

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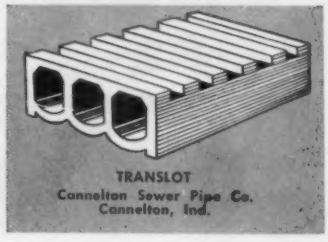

TRANSLOT
Cannelton Sewer Pipe Co.
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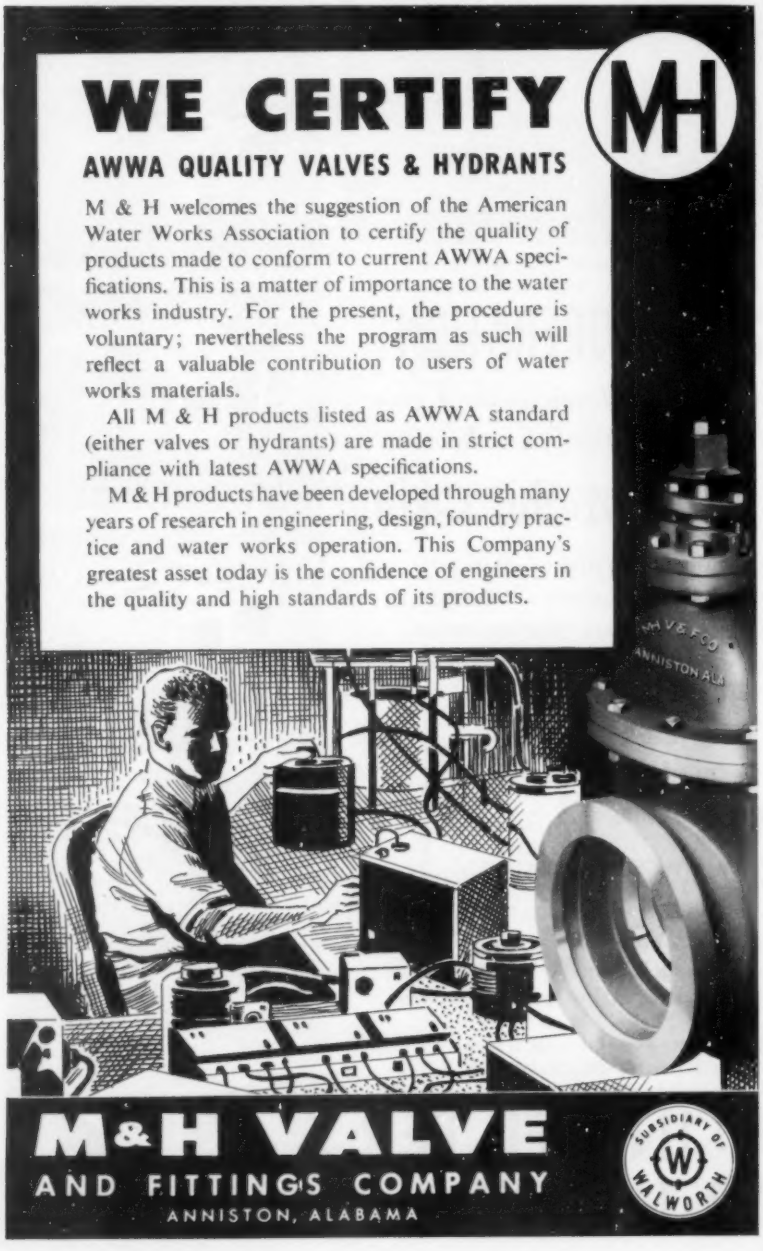
that should be placed on plating wastes admitted to sewers, the ranges of limits are narrower than might be expected in view of the complexities of the wastes and their effect on sewage treatment. Limits of pH of the wastes are from 5.0 to 10.0 and for cyanides, 10 to 20 ppm; considering the sewer collection system only. For protection of primary treatment processes, pH, oils and greases need be considered. In the case of the receiving stream only, a set of limits used by several states prohibit cyanides, and tolerate copper to 0.3 ppm, hexavalent chromium to 0.05 ppm, cadmium to 0.4 ppm; zinc to 0.3 ppm, and nickel to 2.0 ppm. Insoluble metals transferred to the sludge digestion tank tend to concentrate in the digester. Tolerances of digestion processes are reported in the following limits: to cyanide, 1 ppm; copper, 1 ppm; chromium, 5 ppm; and zinc, 5 ppm. The efficiency of biological secondary treatment can be affected from the standpoints of nitrification and BOD reduction. Tolerances can be built up, but apparently the 1 to 2 ppm limit for cyanide is acceptable to secondary treatment. Cyanides interfere with chlorination to the extent of reacting chemically with chlorine. In considering the effect of plating wastes on design of sewage treatment plants, oils and greases probably do not require special attention, and chemical feeders to combat sudden excessive concentrations do not appear warranted. Sludge digester mixing equipment should help distribute shock loads. Trickling filters appear able to absorb shock loads of the wastes more readily than activated sludge treatment. More than the usual chlorinator capacity will be required if cyanide wastes are present.

"What Are Safe Limits for Treating Metal Plating Wastes with Sewage?" By F. W. Kittrell, R. A. Taft Sanitary Engineering Center. *Wastes Engineering*, May.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Plating Waste Treatment for Disposal

Precipitation, thickening and filtration are the most satisfactory means of disposal of plating wastes, from the standpoint of pollution potential and labor and maintenance costs. However, the cost of chemical detoxification and neutralization must be evaluated. A typical plating operation from a moderate-sized unit discharges about 100,000 gpd. Wastes containing oils and greases are usually treated separately by passing the liquids with a minimum of turbulence vertically through a baffled tank or by the use of flotation techniques. Cyanide wastes must be chemically oxidized to cyanates, usually with chlorine or hypochlorites. The metal constituents are precipitated by the introduction of alkaline agents. In the absence of cyanides metal precipitation is usually complete if the pH exceeds 12.5. Large volumes of the treated waste, which becomes a slime in the presence of colloidal plating additions can be handled in settling basins or thickeners. For small plants, treated waste may be processed by a continuous vacuum precoat filter, using filter aids of low density, such as sawdust, and fly ash.

"Plating Waste Disposal by Precipitation and Vacuum Filtration." By H. M. Small and W. C. Graulich, Filtration Engineers, Inc. *Industrial Wastes*, May-June.

Oxidation by Catalytic Combustion

In the case of fume combustion, a catalyst provides a means of oxidizing odorous, combustible hydrocarbons in process exhaust gases to carbon dioxide and water at much lower temperatures than are necessary to complete the oxidation by

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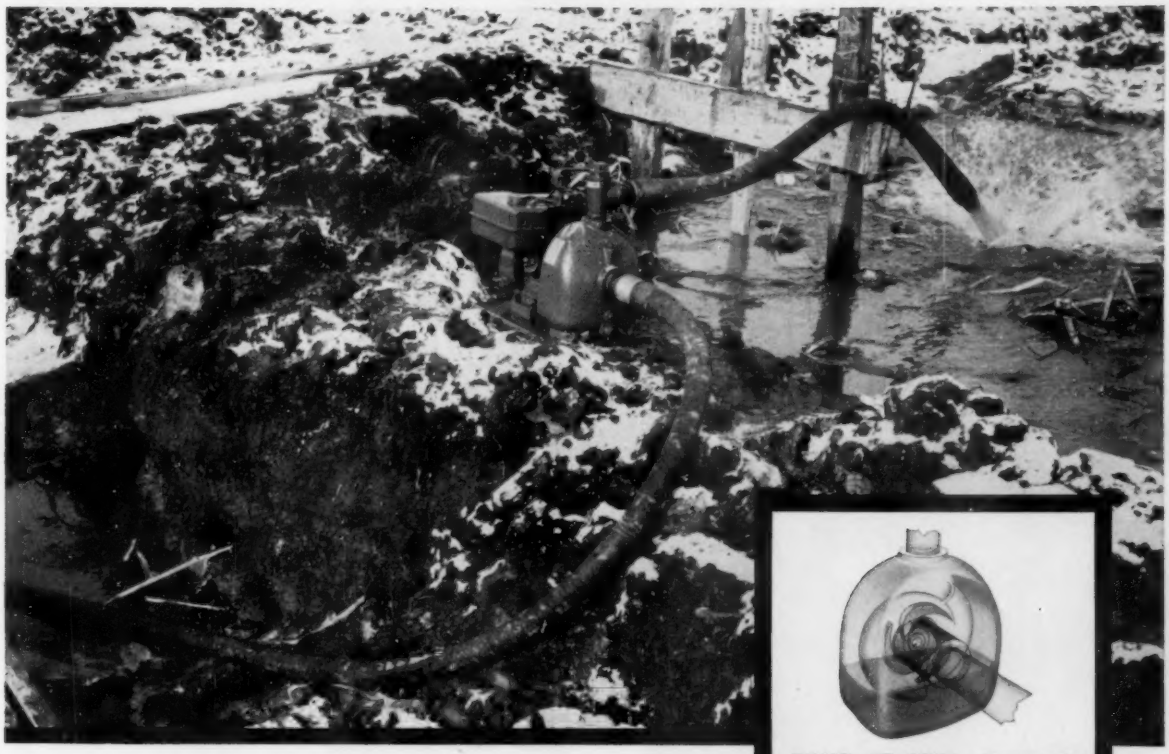

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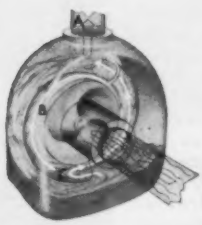
*Provided standard equipment supplied with pump is used.

PUMP AT REST—Captured liquid retained for priming. Note absence of the usual check valve.



PRIMING ACTION—Entrained air (B) escapes at (A) to be discharged. Priming liquid returns (C) to entrain more air.

PUMPING ACTION—Straight-in suction voids entrance restrictions. Water enters direct to the eye of the impeller.

the addition of direct heat alone. The fume stream entering the catalyst area must have a temperature above that required for oxidation to occur, usually 500° F to 650° F; there must be sufficient catalyst surface area available to permit completion of the reaction; and sufficient oxygen must be available to fulfill the oxidation demands of the contaminants. The fume stream temperature is a function of the type of fume present and may be as high as 800°F for crude asphalt stock or as low as 450° F for gasoline vapors. Once catalysis has been established with fumes of high heat energy, the required entering stream temperature may be decreased substantially. There are 600 operating installations on paint and enamel baking ovens, alone, and over 1000 installations on all combustible contaminants in process exhaust gases.

"Catalytic Fume Combustion of Organic Chemical and Petro-Chemical Wastes." By R. J. Ruff, President, Catalytic Combustion Corp. *Industrial Wastes*, May-June.

Evaluating Pollution Potentials of Industry

A "background study" is performed prior to construction of a project which would influence a stream, lake or tidal waters from a pollution standpoint. It should document the existing environment under all water conditions, determine water quality conditions which may exist under full development of water resources, establish the water quality characteristics that must be maintained, obtain sufficient data to permit full evaluation of allegations of future pollution damage, and evaluate the relative importance of dollar values of present and possible water uses. Data obtained should include dollar value of present and future uses, sources and characteristics of existing pollutants, characteristics of existing physical structures, tolerance limits of water users to pollutants, critical seasonal conditions, and climatological data, water movement, water quality, biological flora and fauna, bottom deposits, and physical characteristics of the water body. The collection of biological data may include the use of plankton tows, dredgings and fish nettings. Bottom deposit samples can be secured by dredging or coring and should be examined for odor, appearance, texture, carbon content, and the presence of deposited pollutional material.

"The Value of a Background Study." By R. O. Sylvester, U .of Washington. *Sewage and Industrial Wastes*, May.

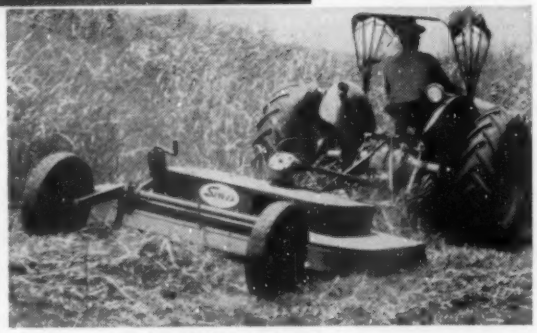
Mowers designed for municipal jobs added to farm-famous *Servis* line.

New

E-60. Finding its Gyro cutters sturdier than necessary for many jobs, Servis introduces this 60" gear-driven clipper. Light weight, yet guaranteed to cut tough, 1½" brush. Pull and lift models. Sells for considerably less than the heavy Gyro models.

New

SC-80. Introduced to some territories late in '56, this new belt driven, twin-bladed, rotary mower cuts 1" brush — on an 80" swath. May be offset up to 32" outside rear tractor wheel. Very economical to operate.



New improvements in famous Gyro line:

Famous Gyro cutters, which shred brush up to 3" thick, now offer fan-type suction blades to lift stalks off ground. Also available, new ribbed rear skirt to raise stalks back up into path of blades. Re-positioned stationary blade and a front guide plate are other improvements that give superior shredding.

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Other Articles

"Pilot Studies to Predict Effects of Waste on Receiving Waters." By H. W. Bialkowsky and P. S. Billington. Studies feature a volumetric study of a harbor and river using a dynamic model of the system, to help determine optimum plant discharge points. Sewage and Industrial Wastes, May.

"Statistical Interpretation of Pilot-Plant Studies." By H. Van Blarigan and J. C. Lamb, III. Sewage and Industrial Wastes, May.

"Neutralization of **Acid Wastes** before Discharge." The vast increase in the use of acids during the past few years and the higher sewage treatment standards make it essential that industry did more to pre-treat wastes previously accepted in public sewers. The Surveyor, May 4.

"Flocculation as a Treatment for **Petroleum Refinery Waste** Water." By W. B. Hart, Industrial and Engineering Chemistry, May.

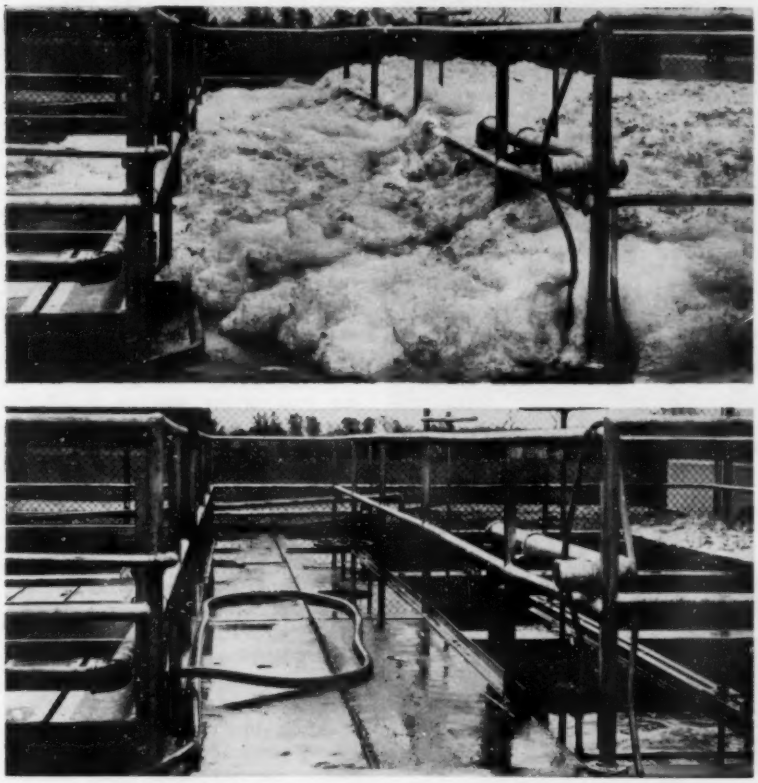
"Insecticide Wastes Treated on Activated Charcoal." Surveyor, April 27.

• • •

Water Usage in Toledo

On the average day during 1956, the Toledo, O., filtration plants delivered 63.623 million gallons of water. Maximum day was 96.70 mg; and minimum was 41.09 million gals.

Antifoam Agent Solves Waste Foaming Problem



● **FOAM KNOCKED DOWN** in two minutes! These pictures, taken 120 seconds apart, show effectiveness of antifoam agent at plant treating antibiotic wastes.

THE ANTIBIOTIC WASTE reduction plant of the Upjohn Company, Kalamazoo, Michigan, recently faced a severe foaming problem. Daily flow through the plant averages 100,000 gallons, a substantial proportion of which is antibiotic spent beers. These produce much greater quantities of foam, and much more stable foam, than that usually encountered in municipal sewage treatment plants.

Reaching heights of six feet or more, the foam would spill out over the sides of the aeration tanks, completely covering catwalks. The foam, being slippery, presented a hazard for men working around the tanks and also delayed the men in performing their work. The foam was also picked up by the wind and blown into surrounding areas.

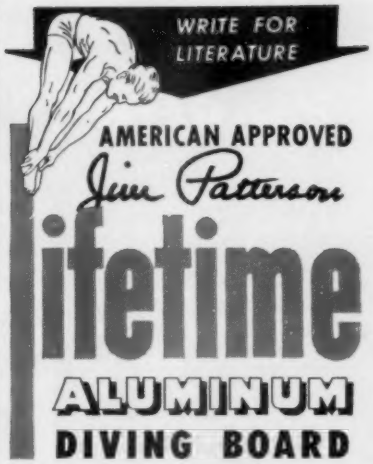
As a result of laboratory tests by the Hodag Chemical Corp., an entirely new antifoam agent was custom formulated for Upjohn Co. Named Hodag S-118, the new antifoam is specially designed for waste treatment of antibiotic spent beers, but it also has application in a wide variety of chemical and industrial processing situations. Upjohn reports a usage of 10 parts per million for effective foam control. This amounts to an average cost of approximately $1 per day, or 1¢ per 1000 gallons of waste processed.

The agent is applied by means of a spray system and the liquid antifoam is piped directly from its shipping drum to a pump. It is a free-flowing liquid that requires no heating or special handling before application. It can be closely regulated, and does not clog the injector nozzles.

• • •

Air Terminals in the New York City Area Are Big Business

The four Port Authority airports in the metropolitan area of New York and New Jersey handled, during 1956, a record 12,109,583 passengers, up 11.6 percent from the previous year; 323,128,500 pounds of air cargo, up 6.9 percent; and 92,797,100 pounds of air mail up 7.4 percent. To accommodate this air traffic and provide for future needs, the Authority has invested $153,000,000 in the four regional airports and its fifth avia-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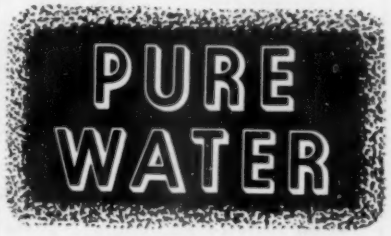

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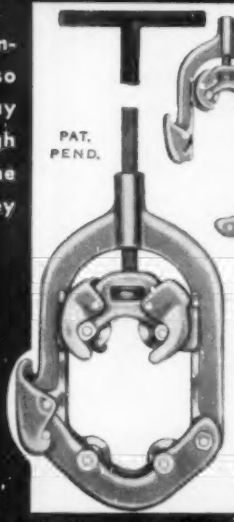

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tion facility, the Port Authority-West 30th Street, Heliport, which was provided during the year.

New York International Airport handled 4,490,050 passengers, as compared with 3,659,099 in 1955, an increase of 22.7 percent. Aircraft movements totaled 149,825, as compared with 123,439, up 21.4 percent. During the year, 14,915 people were employed at the airport, with a payroll of $84,000,000. Three hangars to cost an estimated $45,000,000 were under construction at the field; a $6,000,000 central heating and air-conditioning building to serve the Arrival Building, individual airline terminals and the Port Authority Operations Building was under way; a $5,500,000, five-building international air cargo center was completed; plans were developed for construction of a $5,000,000 five-story, 320 room hotel, the International Hotel, to be operated by Knott Hotels Corporation; and the CAA's $1,500,000 Operations Building (Hangar 11) was completed.

A new traffic record was established at Newark Airport in 1956 when it handled 2,183,256 passengers, as compared with 1,820,288 in 1955, an increase of 19.9 percent. There were 121,387 aircraft movements, as compared with 105,644, an increase of 14.9 precent. Employment at Newark also reached a new high with 3,758 people earning $22,000,000 in 1956. During the year, the Port Authority invested about $1,750,000 in new construction and improvements to existing facilities at this field, bringing the agency's total investment to $29,-200,000. The CAA began installation of an instrument approach system the northeast end of Instrument Runway 4-22. This new landing system will make possible a reduction in the number of take-offs over residential areas under certain weather conditions.

A million-dollar aircraft parking and taxiway program was completed during the year. A new $950,000 taxiway was constructed parallel to Runway 4-22 to facilitate use of the runway for take-offs to the north over the Kearny meadows. The project included construction of additional aircraft parking positions and a run-up area at the west of Runway 11-29 to permit engine warm-up for take-offs to the east over Newark Bay without blocking access to the runway.

In the passenger terminal, an air-conditioning system was being installed at a cost of $330,000; the

east and west arcades of the structure were being extended at a cost of $220,000 to provide covered access to six additional aircraft gate positions; a $3,000,000 hangar and a $375,000 industrial building were among the major items under construction at year's end.

La Guardia Airport in 1956 handled 5,403,239 passengers, as compared with 5,350,047 in 1955, up 1 percent. Aircraft movements totaled 229,714, as compared with 223,005, up 3 percent. During the year, 8,406 people were employed at the airport, with a payroll of $47,000,000. Since assuming responsibility for La Guardia Airport in 1947, the Authority has invested about $9,900,000 in its development and rehabilitation. About $2,500,000 was expended in 1956. Improvements at this major airport included a $1,000,000 drainage and rehabilitation program and the acquisition of property to permit CAA's installation of a centerline approach light system for the instrument runway.

At Teterboro Airport, 222,187 aircraft movements were handled, up 1.2 percent over 1955. The Port Authority has invested $8,600,000 in this, the country's ninth busiest airport. The acreage was increased from 500 to 915; its two runways were lengthened 500 feet from 4,500 to 5,000 feet and an operations administration building was provided.

COUNTY REFUSE COLLECTION

While our County provides refuse disposal facilities, not only for the unincorporated but for most of the cities of the County as well, we are not in the refuse collection business at all. We do have a couple of Inspectors who ride herd on the private collectors who haul refuse over the County highways to assure satisfactory compliance with our ordinances in this regard, both concerning the contract haulers and the householders.

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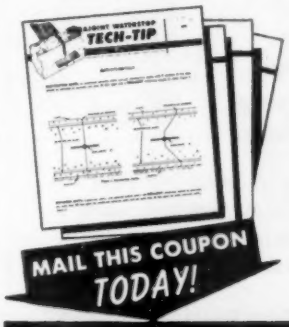

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DEPT. 24

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In this connection, there is one interesting facet which probably is not particularly new. Each private contractor who hauls refuse on County roads as a contractor, and not just in connection with his own business, must have a County permit and must meet certain requirements as to equipment, maintenance of equipment, meeting certain regulations, etc. He is assigned to a prescribed district. He may not solicit business outside of that district and he is expected to serve that district competently or the size of the district will be cut down. There are always cases where it can be more efficient for a neighboring contractor to render services on the opposite side of a border street. Swapping such as this is permitted when approved by both contractors involved.

If a refuse collection contractor notifies us he is going out of business, we try to see that this void is filled before he quits in order to safeguard the sanitation in that area. Several times we have had to apply pressure on some of the contractors who were rendering inadequate and irregular service. In only one case have we reached the stage where we have been compelled to let another contractor into an area. We did so only after he presented a considerable list of prospective, signed-up customers.

The name of the writer and his location are withheld at his request, but the data he presents indicate the need for and feasibility of county-controlled operations—Editor.

• • •

Temporary Bridge Built at Low Cost

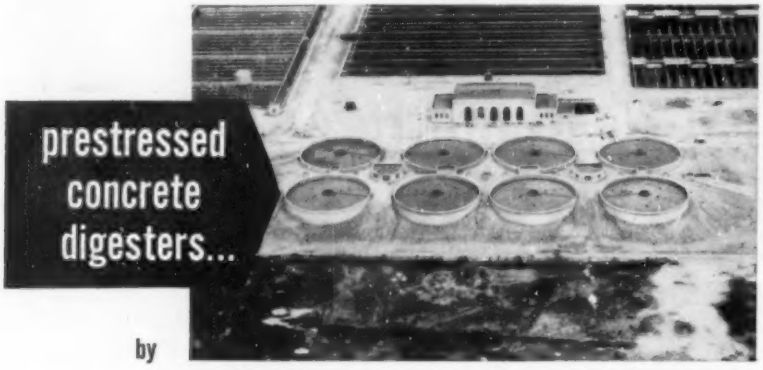
ONE OF THE West's longest girder-type bridges is nearing completion across the Columbia River at Priest Rapids dam site. This 1,500-foot wooden structure, though durable enough to last many decades, will remain in service only from four to five years while the Priest Rapids dam is under construction. It will not be used by the general public.

This structure demonstrates the unusual versatility of glulam timbers, man-made from Douglas fir. These were designed and fabricated by Timber Structures, Inc. at the

● **EACH of the 4 girders is made up of 39 laminations of Douglas fir.**

Portland, Oregon, timber fabricating plant. The girders are 100 feet long, and are 12¾ by 63⅜ inches in section. Each beam is made up of 39 laminations of 1⅝-inch fir dimension. Four of these girders are used for each of the 15 spans in the bridge. After lamination and fabrication, the girders were given a pressure treatment of 50-50 creosote to eight pounds per cubic foot.

The bridge is of the conventional girder type, with a clear roadway between wheel guards of 24 feet, and designed to support a 100,000 pound truck in each of two road-



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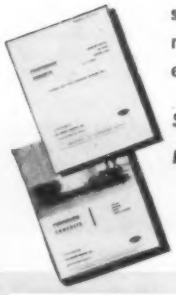

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ways in each span, and an alternate loading imposed by a diesel locomotive and car at the centerline of the bridge.

The bridge is required for movement of materials across the Columbia river. It will be dismantled and removed when the dam project has been completed.

Merritt-Chapman & Scott decided on using glulam beams because they provided ample strength, were cheaper than steel, more quickly obtained, easier to erect and could be put in place faster. Also dismantling is relatively easy and there is a high salvage value in the glulam beams.

Construction was simple, which meant that ordinary construction crews were able to do the entire job without calling on specialists or special erection crews. Four girders were used for each span, with the center members on 6-ft. centers and the outer members on 7-ft. spacing. Doweled to the supporting girders were 10 by 10-inch fir ties, and this deck was covered with 6-in. fir planking running longitudinally across the bridge. This insures a deck capable of supporting the tremendous weights imposed by the construction equipment.

The beams are built up of selected structural grades of Douglas fir lumber. Bent supports are welded steel I-beams supported by cylindrical piling which rest on concrete footings. A concrete curtain protects the piers on the sides and upstream edge from debris and damage during high water.

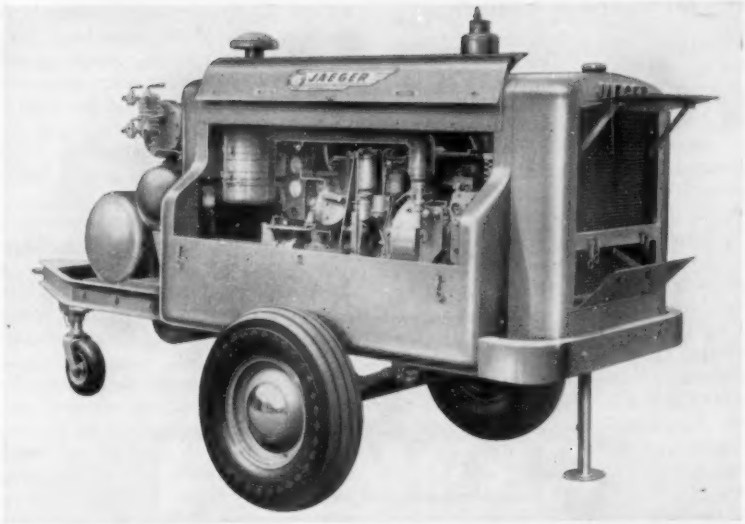
The wooden beams were shipped from Portland, Ore., by rail to the job site and then loaded onto barges for transporting to the exact position needed for bridge assembly.

• • •

Street Sweeping in El Paso, Texas

Six street sweepers are operated by the City of El Paso, Tex. All of these are equipped with Servis recorders. During the 1956-57 fiscal year 54,199 curb miles were swept and 26,724 cu. yds. of refuse were removed by the six machines. There are two Wayne sweepers with double gutter brooms and four Elgins. Hand sweeping by 16 men removed 7,865 cu. yds.

The six sweepers used 362 brooms during the year of service. A test broom made by Rynal Corp. was used on one Wayne machine and, at the date the report was written, had run 566 miles with "not more than ½ inch of wear on it" according to Supt. Ed F. Muckelroy.



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(*Continued from page* 123)

to each other, and how responsibilities for every function are assigned to specific positions. The design shows levels of authority and responsibility and the means of communication and coordination among the functional groups and positions vertically and horizontally. The organization plan or design is, therefore, structural.

As the functions and functional groups compose an organization, so positions compose each function. Positions are the "building blocks" of the functional organization units. Engineers, through structural design, provide for stability and safety of a structure under load. Similarly, Management Engineers design organization structures by clearly stating what each function is and how it is articulated with other functions. Just as the functional arrangement must cover all operating requirements, leaving nothing out, so job descriptions must spell out the details of each function in statements of tasks that completely fill in the functional framework of the organization.

Positions, therefore, should be designed as structural components of organization. More important, they should be designed as rewarding and satisfying occupations for men and women. Positions should be able to pass three tests:

1. Are they in fact satisfying occupations with outlets to still better positions?
2. Can men and women be readily trained to discharge the duties and responsibilities?
3. Are the duties and responsibilities homogeneous so that compensation can be fairly determined?

Re-design of positions may be desirable because of too narrow content or too broad content. In the former case the job may be confining, tiring and monotonous. In the latter case it may cover so many things that training is too difficult. The well-designed job calls for a few closely-related skills with enough variety to be interesting. The skills should be related to one function for ease in training and supervision. They should rate fairly close together on a job-evaluation scale to prevent dilution of grade and to warrant commensurate pay. What we want to do is pay professional salaries for professional responsibilities, technical salaries for technical skills, and clerical salaries for clerical and related office tasks.

The most resourceful way to redesign engineering and other positions is to express the several planned public works programs in terms of work programs and schedules for each major organization unit. Descriptions of the work required for each work program would then be written, describing the "elemental" tasks necessary and the general estimate of man-days required per unit of scheduled time. The detailed tasks would then be classified and rated in a manner similar to job evaluation. Each task would be identified with a particular labor grade of the job evaluation plan. The tasks within a particular labor grade would then be grouped in "families" that require similar education, aptitudes, training, and experience. Jobs then can be designed for these families of related tasks, with built-in variety for job satisfaction.

Finally, the new jobs and satisfactory old jobs are divided into the work programs to give data for manning tables for each organization unit, and from these manning tables, budgets of positions are developed for continuing management control of the labor force.

This procedure is simple, practical

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If positions are well designed, salary administration and personnel administration are greatly simplified. They are simplified because well-designed positions are clearly-defined, valuable, and fairly-priced in the personnel market.

Improved Personnel Administration

Personnel administration as a management function is directed toward one thing: conservation of investment in personnel staff, giving stability, security, and growth potential to the staff. Executives, supervisors, engineering specialists and workers of lesser skills possess an aggregate of experience and skills that is truly a valuable investment. Any practice or procedure that conserves this investment reduces the cost of personnel administration. Any practice or lack of foresight that causes high turnover, personnel unrest, errors, and grievances is a waste of investment values.

Control of Personnel Costs: Personnel costs are a compound of salaries and the varying costs of personnel administration. Both of these classes of costs can be controlled within predetermined limits by means of management techniques. Here are some examples:

1. Comparative salary and wage surveys measure the competitive limits of pay rates. Procedures for regional and national pay data surveys have been perfected by research and proved by practice.
2. Position specifications and position design techniques are applied in establishing the optimum assortment of duties for individual positions.
3. Position evaluation tends to eliminate inequities in pay and should provide a progression of jobs for employees who are growing in experience and knowledge.
4. Merit reviews and performance rating can help to place and maintain employees equitably within the minimum and maximum rates of their labor grade.
5. All of these techniques help to reduce high turnover rates, increase job satisfactions, morale, and loyalty—and therefore they reduce administrative cost.
6. For every requirement of personnel administration there is a tested management technique. These techniques are engineering in nature and are therefore pointed toward satisfying each requirement in an orderly, logical manner, drawing upon scientific and operations research methods wherever they may serve best.

The availability of labor-saving systems and the newer ways of redesigning and enlarging positions create new administrative problems as well as help to solve older problems. These are powerful "tools." They require changes in jobs and changes in departmental functions. They offer opportunities for broader management controls as well as demand better communication among executives because of their great speed and versatility. So more research is needed in administrative techniques. The problems group themselves into organization planning; management controls; and management reports.

Organization Planning

Organizations should be planned to get a job done most expeditiously under appropriate standards of design and cost. The research method is to study the territory, location of personnel, plant, and equipment. Determine the elemental work tasks and distribution of them, both geo-

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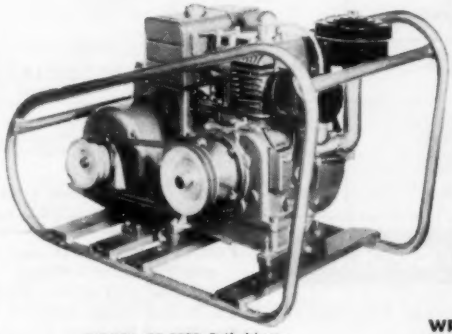

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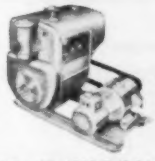

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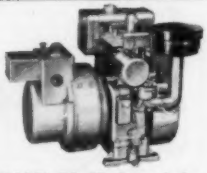

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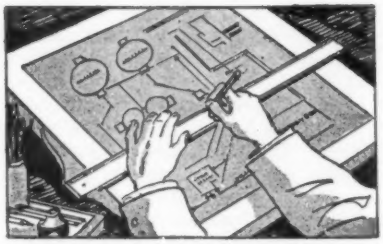

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Management Controls

Management controls are administrative techniques designed to limit the deviation between plans and performance.

The essence of management control is the authority, willingness, and ability to regulate an activity according to a desired or imposed standard. The procedure is the keeping of deviation from standard within permissible limits. Therefore, a system of management controls presupposes the existence and common knowledge and acceptance of department objectives; general program for growth; clearly-defined and published engineering standards; and an organization plan whereby responsibilities are fixed for all administrative and operating activities.

Some basic management controls are defined below:

General Planning Control: This control is largely a delineation of progressive stages of development of public works, supported by schedules of funds, manpower, materials, etc., required for each stage.

Organization Planning and Control: As the department's responsibilities grow, organization planning must anticipate and provide for the changes in functions and the new positions. Here it is necessary to chart the developing organization and key it to the public works program.

Staff Control: Development of supervisory and executive personnel to man the expanding organization must be a part of the program. This is a job of planning and dating the succession to every managerial position.

Fund Control: The summation of expenses for the various phases and projects of the public works program gives the fiscal requirements for the program. Available funds are also recorded. Control of

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allocation and use of funds is the management technique that matches the money with the task.

Design Control: Control of engineering standards involves a continuing adjustment between funds available and the increasing technical demands of the operations themselves and the people concerned with their use. Even engineering standards are fluid in these times as the results of research and new equipment are coming into use daily. Inspections provide records of compliance or deviations.

Expense Control: This is budget procedure, coupling money allocated and spent to results obtained. It should be a "performance budget" as well as an expense budget. The expense estimate would flow directly from detailing of planned projects. The actual expenses would come from expenditure statements and results. The management control exists in examination of variances (with their explanations) and trends and the taking of such action as may be appropriate.

Materials Control: Specifications for materials are engineering standards. Tests are controls of engineering standards. This can be reported on in the form of compliance and deviation reports. The other phase of materials control is the keeping of inventories at the economic level.

Maintenance Control: Control of maintenance is a matter of following a plan of inspection and repair before breakdowns occur. In more detail, management control reports on maintenance should be made by districts. Here again, good management reports cannot be made until the maintenance standards are known and honored and a maintenance schedule is adopted.

Plant and Equipment Control: Plant and equipment can be controlled in relation to the uses expected of it only if its various capabilities are known. The uses are expressed in program requirements. Once the equipment is available, it must be maintained and this control is based on working effectiveness vs. the cost of maintenance.

Management Reports

Management reports are the tools of management control. As a class they are now inadequate because they usually are not complete, not integrated, and not comparative. Reports of simple, figure-facts are not good management tools. Management reports must carry a message, an indication of plus or minus performance. They should say to the executive, variously:

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1. "This activity is up to your expectations; dismiss it from your mind."
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Requirements for Management Control Reports

Accuracy

Information must be true or representative within acceptable margins of error.

Timely

Information must be furnished while time for corrective action still remains.

Concise

Meaning must be readily apparent without requiring analysis or long reading time.

Comparative

Results must be presented not only in magnitude, but more important as variances from a standard of performance; that is, a desired value or trend; a budget; a bogey.

Explanatory

Reasons for deviations from standards should be shown.

Indicate Action

Should recommend a course of action or a decision or possible alternatives in executive action.

Understandable

Should make use of technical devices of good communication, such as statistical correlations, parallel tabulations, graphs, and ratios. Sometimes it pays to read reports to executives or project them on a screen for exposition and discussion.

Research the Key

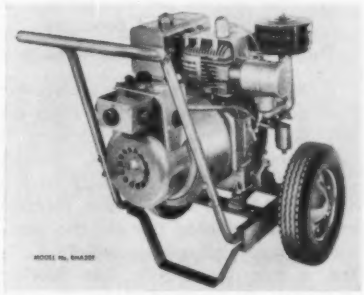
Research is the key to betterment of public works programs—more and broader research and speedier and more effective applications in practice.

It can be said that the idea of research is accepted. The problems arise in making practical and economically-sound applications to the many, differing conditions, both physical and managerial, that exist in counties and cities throughout the land.

Identifying these problems is a top administrative responsibility. Because top management is so overloaded, research in administrative methods, organization planning, and staff development appears to be the most promising way open for executives to expand their administrative capabilities.

PUBLIC WORKS EQUIPMENT NEWS

Mobile Electric Generating Plant



Unit weighs approximately 200 pounds and also can be mounted on steel skids

An electric generator plant which is unusually mobile is announced by Pioneer Gen-E-Motor Corp. It is mounted on a frame and dolly, supported by large size rubber-tired wheels and has a tubular steel hand guide. It provides an output of 2300 watts, 115 volts AC. It has four AC outlets to take full advantage of the 2300-watt capacity and operates at 3600 rpm. It weighs approximately 200 lbs. and can be mounted on a tubular steel skid if desired. For full details write Pioneer Gen-E-Motor Corp., 5841 West Dickens Ave., Chicago 39, Ill., or circle **No. 7-1** on the reply card.

Lightweight Grass Trimmer

A new engine-powered lightweight grass trimmer has been announced by Rowco Mfg. Co. The machine, named "Trim-Kut," has an overall cutting width of 12 inches and an adjustable cutting height of 1½ to 2¼ inches. The engine is a Clinton two-cycle 1.6-hp; the wheels are heavy duty steel disc type with 6 x 1½-inch semi-pneumatic tires and replaceable bronze bearings. The unit trims cleanly around trees, monuments, buildings and flower beds, and it is recommended for use in parks, highway departments and golf courses. For full details write Rowco Mfg. Co., Inc., Keene, N. H., or circle **No. 7-2** on the reply card.

Clean More Sewers With Less Manpower

An automatic bucket dumper that is available for Flexible bucket machines is announced by Flexible, Inc. A hook arm picks up the full bucket and swings it out and opens the bucket jaws automatically. After dumping, the spring loader arm automatically returns to "pick-up" position. It can be easily installed on a Flexible bucket machine in 30 minutes. For full data write Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif., or circle **No. 7-3** on the reply card.

Versatile Utility Tractor

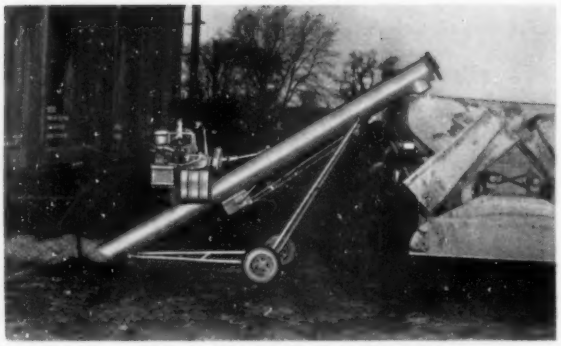
Unloading and handling of pipe, castings, cast stone or marble, and other bulky materials or machinery is no problem with the Massey-Harris-Ferguson tractor equipped with utility boom. The MHF utility boom is a telescoping type which pivots through 180° and can lift materials up to 14 feet. Fully extended to 72-in., it can lift 1000 lbs.; retracted to 48 ins., it has a lift capacity of 1500 lbs. The operator sits high and clear of the boom where he has an excellent view of the load and the spot where it will be placed. The Work Bull is equipped with a 42-hp, 208-cu. in. gasoline engine, with diesel engine optional at extra cost. For full details write Massey-Harris-Ferguson, Inc., Quality Ave., Racine, Wisc., or circle **No. 7-4.**

Jet-Blaster Announced

The introduction of the new Model B6 portable Jet-Blaster, sand blasting machine, has just been announced by the Air Placement Equipment Co. The unit has a 650-lb. capacity, handles conventional abrasive materials, and has an adjustable flow control. It is designed for uses such as removing corrosion, paint, concrete or scale. A nozzle for wet sand blasting, and remote controls is available at additional cost. For full details write Air Placement Equipment Co., 1009 W. 24th St., Kansas City, Mo., or circle **No. 7-5** on the reply card.

Massey-Harris-Ferguson utility tractor can be used on many construction projects

Specified density is very rapidly achieved with this unit



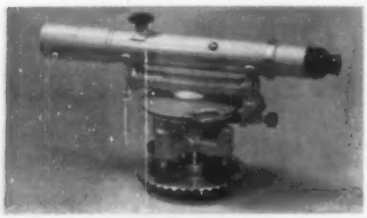
No pits are needed when freight cars are being unloaded

Vibratory Compactor For Soil Compaction

This compactor is of the vibratory pan type having 6 independent compactor units in the workhead which may be detached and operated individually grouped or re-grouped to fit job requirements. Power, however, has been stepped up to the point that each of the 6 compacting units now delivers up to 4200 3-ton blows per minute—an increase of approximately 2000 lbs. per blow over the previous model. Among other improvements are a single industrial engine of ample power (instead of two) operating both the generators and the transmission. Two generators of 7.5 KVA capacity each supply current to the compactors. Speed of travel is 10 feet per minute to 10 miles per hour. Further details from Jackson Vibrators, Inc., Ludington, Michigan, or circle **No. 7-6** on the reply card.

Gurley Introduces Light Dumpy Level

A new light Dumpy Level—in two models—has been introduced by W. & L. E. Gurley. One model Number 380, is without horizontal circle. The other, Number 380-A, has a circle for reading horizontal angles to five minutes. It is a compact instrument, stable in construction and retaining adjustments indefinitely. The optical system and leveling head and materials of its construction enable it to compare favorably with larger models made by Gurley. The telescope is short (13 inches) but features brilliant illumination, hard-coated lenses and covered glass reticle with cross lines. Minimum focus is 6½ ft. The spirit level features protective mounting, "standout" bubble and sensitive uniform movement. The instrument was designed chiefly for engineers engaged in construction of foundations, abutments, retaining walls or piers; in grading streets or highways; in setting steel for buildings and roads; or in hydraulic or drainage projects. For further details write W. & L. E. Gurley, Troy, N. Y., or circle **No. 7-7** on the reply card.



Effortless, Dependable Power Steering for Motor Graders

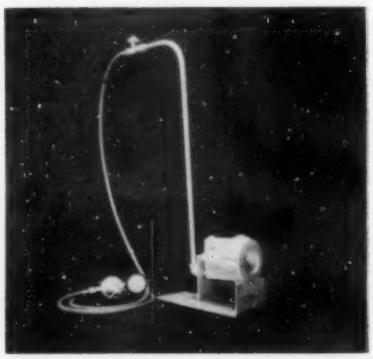
Recently introduced by Precision Controls Co., the Gyde-Master power steering unit is a hydraulic-powered steering booster incorporating control valve and power section in one compact housing. It mounts in the steering shaft of a vehicle and provides steering control by applying torque to the steering shaft. The unit can be connected into and operated by the vehicle hydraulic system, provided the vehicle system is suitable, thus accomplishing a very economical installation. Designed initially for accessory installation on existing vehicles, it is equally suitable as original equipment on new machines. Mountings are available for the following motor graders: Adams: Allis-Chalmers; Caterpillar; and for almost all makes and models of wheel tractors (Ford, Oliver, John Deere, Massey-Harris, Minneapolis-Moline, International Harvester). For complete information write Precision Controls Company, 5038 Chowen Avenue South, Minneapolis, 10, Minn., or circle **No. 7-8** on the reply card.

Portable Screw Conveyor Delivers up to a Ton a Minute

A new portable screw conveyor that can be put into operation on any site in a matter of minutes is announced by Baughman. Trucks can tow the conveyor easily to job sites. Available with either electric or gasoline motor power, the conveyor will deliver as much as a ton a minute of any free-flowing material. As an accessory, Baughman is also producing an open screw attachment which is self-feeding into any stacked, free-flowing material. The unit is 15 ft. long and can be raised or lowered easily by a simple hand crank. Complete information from Baughman Mfg. Co., Jerseyville. Ill., or circle **No. 7-9** on the reply card.

Liquid Petroleum Gas Burner

This burner is designed for use with tar kettles, asphalt trucks and any other applications where an abundance of quick, clean heat is required. The new Wemco Model TK-2 burner operates on liquid LP Gas and will deliver over 500,000 BTU per hour, continuously. It can also be operated on vapor LP gas. Also obtainable as a unit with fully automatic controls. For details write Wemco Products, 1031 E. Ten Mile Rd., Royal Oak, Mich., or circle **No. 7-10** on the reply card.

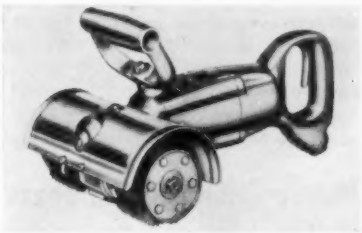


Carballs Provide CO_2 for Small Water Plants

With the development of the small series Carball, Sizes "O" and "OO", Walker Process now offers carbonation units for all lime softening plants from the very small to the largest. With capacities ranging from 55 to 660 pounds of CO_2 per day, these units are intended for lime softening plants as small as 100 gpm, and may be used in plants up to 1,400 gpm. This package system operates on either methane or propane gas. The new Size "OO" and Size "O" Carball, like the larger Carballs, are shop assembled package units, used with Sparjer CO_2 diffusion systems and are engineered for each application. Description and details of the units may be obtained by writing Walker Process Equipment Inc., P. O. Box 266, Aurora, Illinois, or circle **No. 7-11** on the reply card.

Cleaning Tool Features "Floating Rotor"

A pneumatic cleaning tool with a "floating rotor" principle, has been introduced by the Aurand Mfg. & Equipment Co., for removing rust, scale, old paint and foreign accumulations from iron, steel, brick and



concrete surfaces. The new MP4 model pneumatic tool has a rotor which floats on the spindle on which it is mounted. Therefore, any thrust which may be applied to the spindle does not affect the functioning of the rotor, since the rotor is a slip fit on the spindle. The air entering the governor housing is controlled by the governor moving in such a manner as to push the plunger head closer to the face of the jet. This allows the proper amount of air to enter, and keeps the tool operating at efficient speed. The motor will develop slightly more than 1 hp when operated on 90 lbs. air pressure. Maximum air requirement under load is 42 cu. ft. per minute; for free running, 20 cu. ft. per minute. Complete details from Aurand Mfg. & Equipment Co., 1210 Ellis Street, Cincinnati 23, Ohio., or circle **No. 7-12** on the reply card.

Shawnee backhoe is approved for mounting on International "130" utility tractor

Another Derrick Added By Holan

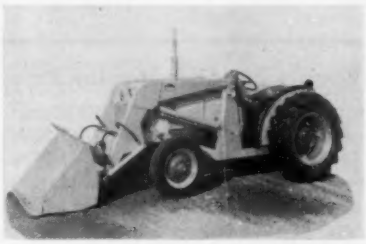
J. H. Holan Corp. has added another derrick to its comprehensive line, this one a two-legged unit with a stinger. The stinger is a double-acting cylinder which extends the derrick head an extra five feet. This allows for handling longer poles than conventional derricks of the same size. However, what distinguishes this particular derrick—called the Holan Series 6800 Power Derrick with stinger—are these features: (1) its ability to lift heavy loads in low ranges; (2) body-loading up to 4,000 pounds; and (3) an operating range that permits the use of power feed attachments to force diggers into the ground. Handling heavy loads in low ranges is possible because of a unique 4-cylinder arrangement for moving the side legs. Two single-acting cylinders move the derrick to within 10 degrees of vertical. Then, two double-acting cylinders (main lift cylinders) take over, giving greater leverage where it is needed. Complete information can be obtained from J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio, or circle **No. 7-13** on the reply card.

Poles up to 75 feet in length can be handled by this derrick with a stinger

Shawnee Economy-Size Backhoe

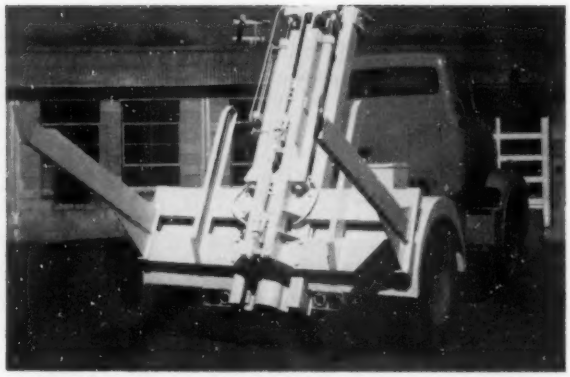
Called the "D 65", the Shawnee backhoe is similar to a scaled-down version of the Shawnee "Scout". It digs 9½ feet deep, reaches 15 feet, and the hydraulic system provides 6200 pounds of digging force at the bucket teeth. No hydraulics are required on the tractor. Utility bucket widths are available from 12 to 24 inches, inclusive. Additional information from Shawnee Mfg. Co., 1947 North Topeka Ave., Topeka, Kansas, or circle **No. 7-14** on the reply card.

Henderson Hydraulic Loaders Fit Many Utility Tractors



A "Fifth Cylinder" automatic hydraulic bucket leveling device is an exclusive new feature on the new Henderson "Chief" hydraulic loaders. Designed for fast loading and dumping, with high payload per lift at low operating cost, the loader is particularly attractive for utility firms and municipalities. The 12 gpm hydraulic system lifts 1750 pounds to full height in six seconds and down in three seconds. There are chromed hi-carbon steel rods and double-acting cylinders throughout and fingertip control of all hydraulics. Models are now available to fit these utility tractors: Case; Oliver; IHC; Minneapolis-Moline; Ford; Massey-Harris-Ferguson and others. A full line of attachments including dozer blade, utility bucket, crane boom, fork lift and scarifier are available. Complete information from Henderson Mfg. Co., Inc., Cedar Rapids, Iowa, or circle **No. 7-15** on the reply card.

Model F Sherman power digger is attached to Ford tractor



Automatic pick-up of Dempster containers with this unit

New Power Digger For Speed and Long Life

A completely new power digger for mounting on Ford Tractors has been introduced by Sherman Products. It features a wide work radius and long reach speed operations. The Sherman "F" can excavate a trench 15 feet, 8 inches long from just one tractor position. The arc of swing is 188°, the reach below grade is 12 feet, and the loading height is 9 feet, 2 inches. An operator can transfer from digging bell holes to trenches without a change of shovels. Also, a full rollback allows heaped loads and faster digging without spillage. The digger can be dismounted from the tractor or mounted in a matter of minutes by removing or replacing six pins and four bolts. Main and swing frames are of heavy-duty steel plates, weldment construction. The sub-frame is full length, box construction, to absorb and distribute digging stresses. For more details write Sherman Products, Inc., Royal Oak, Mich., or circle **No. 7-17** on the reply card.

Electric Plant for Standby Power

A new model 50 KW electric plant is now being offered by Kohler Co. Gasoline-powered and remote starting, the plant is suitable for use in sewage disposal plants and in other applications where an ample supply of standby power is desirable. Features include 6-cylinder liquid cooled engine developing 115 hp at 1800 rpm, and 60-cycle rotating field generator with automatic voltage regulation. Available in 120/208, 115/230 and 230 volt models. For full details write Kohler Co., Kohler, Wisc., or circle **No. 7-16** on the reply card.

Rotary Actuator For Remote Control of Valves

Development of a new hydraulic or pneumatic control device has been announced by Carter Controls. The unit has an internal helix arrangement which converts the in-line motion of a hydraulic or pneumatic cylinder into a rotary movement. Thus, the unit is especially applicable to the remote control of valves, and can be operated with air, gas or hydraulic pressure. The rotary actuator can be designed to produce any reasonable degree of rotary movement desired from 0° to 360°, or more if necessary, by increasing the overall length of the helix piston rod assembly. A wide range of inch-pound torque requirements is met with 5 standard models. The unit was primarily developed as an actuator for lubricated plug valves and has been fully field-tested in this type of application. For further details write Carter Controls, Inc., 2800 Bernice Road, Lansing, Ill., or circle **No. 7-18.**

Dempster-Dumpster Type GRD Model 304-F-2

The GRD 304-F-2 is a truck mounted Dempster-Dumpster with fork-like arms, enabling containers to be picked up and set down automatically without the driver ever leaving the cab. This means that the complete handling of a container—picking-up, hauling, dumping and returning to location—is accomplished fast, easily and simply. Hydraulic controls are conveniently located in the cab. The overall height to top of shuttle when fully raised is 23 ft. Height from ground to top of forks when fully raised is 13 ft. The unit will handle all drop bottom type containers up to and including 15 cu. yd. and tilt type up to and including 7½ cu. yd. For further details write Dempster Brothers, Inc., Knoxville 17, Tenn., or circle **No. 7-19** on the reply card.

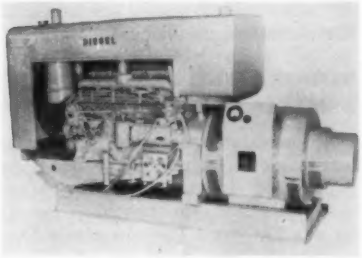
Newly Designed Bulldozer

A newly designed bulldozer is being introduced by the Henry Mfg. Co. for use with the John Deere 420 crawler tractor. Two models are available: the angle tilt dozer ATD-1, and the straight dozer SD-1. Both dozers are designed with box steel push beams, outside mounted to insure against springing blade edges. The dozers operate from the tractor's hydraulic system with a single valve and the float position makes leveling easy. The ATD-1 blade is 96-ins. long and has a 24-in. high moldboard and 6-in. high cutting edge. It angles 25° to right or left. The straight dozer blade goes to a depth of 15-ins. below ground and lifts 42-ins. above; it is 72-ins. long. Height measure and materials are the same as for the angle tilt blade. For further details write the Henry Mfg. Co., Box 720, 1700 N. Clay St., Topeka, Kansas, or circle **No. 7-20** on the reply card.

Masonry Drilling Machine Cuts Cores With Diamond Bits

Replacing jack hammers or carbide drilling, a versatile new core drilling unit is announced by Diamond Products, Inc. Known as "The Hustler", this unit is used to cut holes in existing floors or walls for conduit and piping or to extract test cores from highways and buildings for laboratory analysis. Using surface-set diamond or diamond impregnated coring bits, the machine drills through cement block at a rate of 1 minute per foot or reinforced concrete at 5 to 8 minutes per foot. The basic unit (less motor) weighs only 80 lbs. and is adaptable to any air or electrical motor. Complete units are supplied with heavy-duty or medium-duty electrical motors in speed ranges from 250 to 1000 rpm using 115 volts AC/DC. The feed mechanism is a rack and pinion arrangement with a travel of 28 ins. The diamond coring bits are available in diameters from ¼-in. through 6½-in. in various grades of surface set diamonds or diamond impregnated matrices. For further information, write Diamond Products, Inc., 450 Prospect Street, Elyria, Ohio, or circle **No. 7-21** on the reply card.

Diesel Powered Generating Sets



Units are available from 10 to 35 kw

The Universal Motor Co. has announced that it is now producing a complete line of diesel powered generating sets. These modern designed units are available in sizes ranging from 10 kw to 35 kw. Revolving field type alternators with directly connected excitors are used on all models. The units are available in either single phase or three phase and for 2, 3 and 4 applications and in all popular voltages. Standard equipment on all models includes mounted engine instruments, mounted generator instruments, automatic voltage regulator, rheostat, fuel tank and electric starting. For complete details write The Universal Motor Co., Oshkosh, Wisc., or circle **No. 7-22** on the reply card.

Data On Rotary Mowers and Cutters

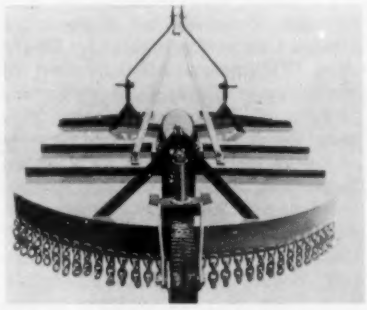
Mow It Quickly And Economically

Units will fit most makes of tractors

Fast, efficient mowing and reduced maintenance costs are possible with the Danco heavy duty rotary mower units made by the Danuser Machine Works. Danco models are available in 66 or 96-inch cuts and are center mounted. They can mow up to 30 miles of right-of-way per day with great maneuverability on shoulders and steep slopes. For further details write Danuser Machine Works, Inc., P. O. Box 5095, Tulsa, Okla., or circle **No. 7-23** on the reply card.

Heavy Duty Rotary Cutter

The new Bush Hog made by Bush Hog Mfg. Co., has been engineered especially for highway use. Designed to eliminate completely danger of objects being hurled from the cutter and striking passing cars, the cutter features heavy chains dragging from front and rear openings. Side skids along the entire length of both sides prevent any digging and scalping. It cuts a smooth swath, and will slash through hardwood saplings up to 3 inches in diameter. The blades are of heat-treated carbon steel at least ½-in. x 3 ins. and are designed to pass each other 360 degrees. For complete information write the Bush Hog Mfg. Co., Selma, Ala., or circle **No. 7-24** on the reply card.



Trash will not be hurled onto the road

Center Mounted Rotary Mowers

The new Sun-Mastr rotary mower model JD-420 S, announced by Sunflower, features exclusive design safety skids and shields. There are no chains to drag down the grass which assures clean, smooth cutting. Hydraulic controlled cutting height is 1 to 10 inches and cutting width is 60 inches. Blades are heat treated spring steel. For further information write Sunflower Industries, Inc., Olathe, Kansas, or circle **No. 7-25** on the reply card.

Servis Rotary Mower

Servis Model SC-80 lift type mower, in offset position, showing maximum 28-inch extension, with chain guards. Also, the Servis Model E-60 lift type clipper is used for cutting short grass. For further details write Servis Equipment Co., Dallas, Tex., or circle **No. 7-26** on the reply card.

Other Makers of Rotary Cutters

B-M-B Co., 319-21 New York Ave., Holton, Kans.; E. I. Caldwell & Sons, 3204 Agnes St., Corpus Christi, Tex.; Wood Brothers Mfg. Co., Box 1488, Oregon, Ill.; The Perry Co., P. O. Box 2057, Waco, Tex.; Tractor and Implement Div., Ford Motor Co., Birmingham, Mich.; J. I. Case Co., Racine, Wisc.

Water Meter Counter

A meter counter for water meters that can be placed outside the home is available from Visi-Meter. The Visi-Meter counter is easily installed by running a cable through the basement window ledge or through the wall. It is also easily adapted to a meter box. All meters can be read in one trip and it eliminates going back to get a reading and the expense and liability of controlling keys to water customers' residences. For more information write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., or circle **No. 7-27** on the reply card.

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.

Division of GREENLEE BROS. & CO.

2428 Columbia Avenue, Rockford, Ill.

GUIDE FOR ULTIMATE STRENGTH DESIGN OF REINFORCED CONCRETE

The American Concrete Institute has available the "Guide for Ultimate Strength Design of Reinforced Concrete," by Charles S. Whitney and Edward Cohen. This paper is intended to serve as a supplement to the ACI Building Code which permits the use of the ultimate strength method for the design of reinforced concrete members. It presents the method in its simplest form with working equations and charts to aid in their application. Copies are available from American Concrete Institute, P. O. Box 4754, Redford Station, Detroit 19, Mich., at 75¢ each.

INTERSTATE HIGHWAYS IN WYOMING

The Wyoming Highway Dept. has recently published a booklet dealing with the Interstate highway system. This has been done with the thought that the average citizen of the state is not familiar with the details of the 1956 Federal Highway Act and does not realize the tremendous effect that the new program will have on Wyoming. Copies may be obtained from the Wyoming Highway Dept., Headquarters Office, Cheyenne, Wyoming.

SYMPOSIUM ON SPECIFIC GRAVITY OF BITUMINOUS COATED AGGREGATES

Topics covered in this bulletin are the following: "The Role of Specific Gravity in the Design and Control of Bituminous Paving Mixtures; Measurement of Bituminous Concrete Core Specific Gravities and Specific Gravities of Bituminous Coated Coarse Aggregates by Means of a Volumeter; Measurement of Maximum Theoretical Specific Gravity of Bituminous Coated Aggregates; Maximum Specific Gravity of Bituminous Mixtures by Vacuum Saturation Procedure; and Specific Gravity and Voids Relationships in Bituminous Pavement Mix Design." Copies are available from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at $2 each.

JOINT AND CRACK SEALING

In a paper on "Cleaning and Resealing of Concrete Pavement Joints by Contract," Fred E. Sternberg and Warren M. Creamer discuss the substantial saving resulting from doing this type of work in Connecticut on a large scale by contract, rather than with state maintenance forces. The remainder of the Bulletin contains a report by A. A. Anderson on the returns from a "Current Practice Questionnaire on Jointing, Fillers, Sealers and Equipment" as circulated during 1955 by the Committee on Jointing Materials in Concrete Pavement. This material was presented at the Thirty-Fifth Annual Meeting of the Highway Research Board and a copy of the Bulletin is available from the Board at 2101 Constitution, Washington, D. C. Price per copy 60¢.

SUBURBAN WATER SYSTEM

The second special report on the growth of the Suburban Water System is available from City and County of Honolulu, Department of Public Works, City Hall, Honolulu 13, Hawaii. The report depicts the financial status and activities of Suburban Water System. Special services, new construction, new subdivisions and finances are some of the departments discussed.

GREENER PARKS AND GOLF COURSES

A manual on latest turfgrass fertilization techniques — covering everything from seed propagation to sample budgets—has been issued by the Du Pont Polychemicals Department, manufacturer of "Uramite" fertilizer compound.

Purpose of the manual, "Turfgrass Fertilization: Its Theory and Practice", is to help professional growers build a turfgrass fertilization program that produces the best results when combined with other turf management practices.

The manual includes information on turfgrass characteristics and their fertility requirements, seed propagation, clipping practices, drainage and irrigation problems, soil aeration, weed and disease control, turf evaluation, and sample fertilizer budgets.

Park superintendents and other professional growers may obtain copies of the turfgrass manual by contacting, or writing to, their local distributors for "Uramite" fertilizer compound.

PROFESSIONAL OPPORTUNITY

Sales Engineer Opportunity

Established distributors wanted to call on municipalities and industries. Product is chemical used in odor and bacterial control in sewage and industrial waste; also in control of odors and insects on refuse disposal areas; insect and odor control on refuse vehicles; and allied uses. Exclusive territories; good commissions; technical assistance provided. Write Box 7C, Public Works, 200 So. Broad St., Ridgewood, N. J.

NEWS OF ENGINEERS

A. E. Stilson & Associates, Consulting Engineers of Columbus, O., have opened an office in the Rose Building in Cleveland. Norman M. Wilke will be in charge of the new Cleveland office with Gordon K. Moellman assisting. The Columbus office is at 245 North High St.

Jerome H. Svore has resigned from his position as Director of Public Health, North Dakota State Dept. of Health to become Senior Sanitary Engineer, U. S. Public Health Service, assigned to the Columbia River Basin Inter-Agency Committee at Portland, Oregon. Stepping up to Svore's place in North Dakota, is **Willis Van Heuvelen,** formerly Director, Division of Water Supply and Pollution Control with the organization. The changes were effective June 1st.

Safety Record in Lincoln Tunnel Third Tube Construction

The Port of New York Authority established a safety record in the contruction of the Lincoln Tunnel Third Tube that is "unmatched in tunnel construction history." Officials of the Port Authority and 21 members of the insurance medical-safety team that completed the complex and dangerous task under air pressure without a single fatality were cited by Idemnity Insurance Company of North America, underwriters of the construction job.

Herbert P. Stellwagen, executive vice president of the insurance company, made the presentation.

CLASSIFIED ADVERTISING AND JOB OPPORTUNITIES

SUPERINTENDENT OF PUBLIC WORKS

The City of Keene, New Hampshire is seeking applications for the position of Superintendent of Public Works. Will have charge of the sewer and water division, highway and drain division, equipment, and office staff. Qualifications preferred are: supervisory experience in public or private construction work; an engineering degree or experience is not required as the City has a City Engineering Department fully staffed at the present time. This progressive City of 17,000 population is located in the heart of picturesque New England. Salary is $7,000 per year maximum. *Write for applications to:*

Mr. Donald E. Chick
City Manager
City Hall
Keene, New Hampshire

CIVIL ENGINEER

A Civil Engineer is wanted for Public Works Department of a New Jersey municipality for surveys and construction, field and office. State education, experience and salary requirements.

Write to:
Box 7-1
Care of Public Works Magazine

CITY ENGINEER WANTED

Excellent opportunity for young, registered civil engineer to take command of engineering and direction of Public Works in thriving Detroit suburb. Salary range $6500-$8000, usual fringe benefits. Submit application and complete resume, including education, experience and personal history to:

City Manager, Farmington, Michigan

WANTED
SEWAGE PLANT
SUPERINTENDENT

SEWAGE PLANT SUPERINTENDENT, for 5 M.G.D. primary plant now under construction to serve as inspector until plant completed and then assume duties as Plant Superintendent.

Salary range: $5,000.00 to $6,000.00 per year.

Minimum Requirements:

1. Two years of college training, with major emphasis in chemistry or biological sciences, with three years of satisfactory experience in operation of sewage treatment works.
2. High school graduation and completion of a special course of training in sewage treatment with a minimum of five years satisfactory experience in the operation of sewage treatment works and demonstration of mechanical aptitude.
3. Satisfactory completion of a special course of training in sewage treatment with a minimum of six years satisfactory experience in the operation of sewage treatment works

and sufficient prior training to be eligible for Wisconsin Grade "A" certificate within two (2) years.

Apply by letter stating education, experience and salary required.

Write to:
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CITY HALL
SUPERIOR, WISCONSIN

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VALUABLE INFORMATION FOR ENGINEERS

Thousands of progressive engineers are finding that our readers' service section is the easy, handy way to obtain new catalogs of advertised products. Be sure and return the postage free reply card opposite page 34.

SEE PAGES 34 to 54

What you should know about

SOIL ENGINEERING

SOIL engineering is the practical application of engineering principles to problems involving the use of soil, either in its natural condition or as a construction material. In this authoritative booklet all phases of soil engineering are treated in simple, easily understandable language. Full information is provided on basic soil properties, classification systems, field and laboratory tests, frost action and compaction. Liberally illustrated and containing many special charts and graphs to assist the engineer in his work.

ORDER from Book Department, PUBLIC WORKS, 200 So. Broad St., Ridgewood, N. J. Only $1.00 per copy.

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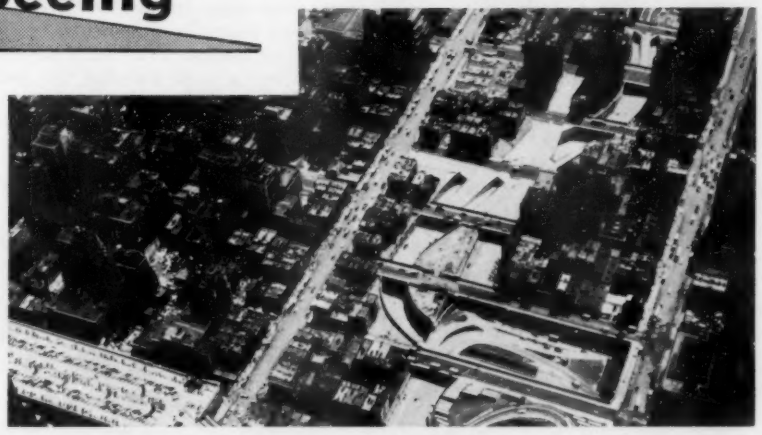
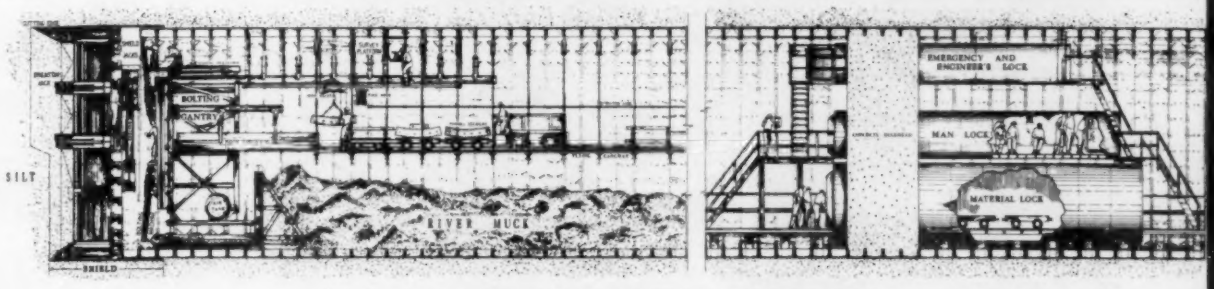
C. H. Stockwell

Three of the most magnificent holes in the ground in the world comprise the Lincoln Tunnel under the Hudson River connecting New Jersey with New York City. As seen from the New Jersey end, the new third portal appears at the right of the two original tubes. To serve increased traffic, $11.5 million has been been spent on on expansion of these approach roads and connections.

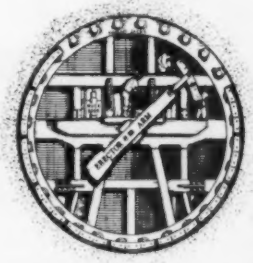
—Worth Seeing



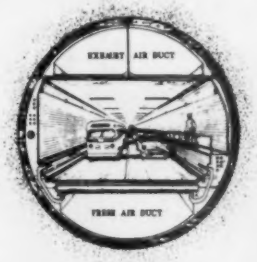
New York end, same tunnel, showing new exits and approaches which include the eight-block long $11 million Lincoln Tunnel Expressway. In foreground: Port Authority Bus Terminal and ramps that provide direct connection with Tunnel for cross-river traffic.



LONGITUDINAL SECTION THROUGH TUNNEL HEADING SHOWING CONSTRUCTION IN RIVER SILT



REAR OF SHIELD
ERECTION OF CAST IRON TUNNEL RINGS



FINISHED TUNNEL SECTION

EXTERIOR VIEW OF CONCRETE BULKHEAD
SHOWING AIR LOCKS

THE PORT OF NEW YORK AUTHORITY

LINCOLN TUNNEL
THIRD TUBE
TUNNELING OPERATIONS

Artist's conception of longitudinal section (top) shows how Lincoln Tunnel Third Tube was driven under the Hudson River using shield method of construction. Shown in the cross section, (left), erector arm places iron segments to form 31-ft. diameter ring. At top right and in cross section are shown solid concrete bulkhead installed inside completed tunnel lining to retain compressed air in tunnel's forward working chamber. Completed cross section, center, shows concrete lining, ceiling, patrol walks and roadway in place. Air in the tube is changed every 1½ minutes by 24 fans.

In underwater equipment and supplies for big pools

modern

gives you so much more

In pools too wide to be vacuumed from the pool deck, Modern shallow water diving equipment now makes vacuum cleaning a low-cost, one-man operation.

This economically-priced outfit, tested for comfort and safety, enables the operator to walk underwater on the pool bottom and whisk up each patch of dirt with a heavy duty Modern vacuum cleaner. *Pays for itself in a single season!*

Just one of over 100 different top quality products manufactured by Modern—one of the world's largest producers of pool supplies, chemicals, appliances and equipment. For anything and everything needed to build or maintain any size pool, call on Modern. Complete line, huge stocks and regional warehouses assure fast shipment. Low prices mean better value. Send for 52-page Catalog No. 13-G.

For name of nearest distributor, see local classified telephone directory or write us.

modern

SWIMMING POOL CO., INC.

One Holland Ave., White Plains, N.Y.

Manufacturers of Swimming Pool Supplies Since 1935

by Arthur K. Akers

★ DON FRICKER is appointed general supervisor, Industrial Advertising and Sales Promotion, the J. I. Case Co., Racine, Wis. Don's advertising background includes the Heil Co., Milwaukee, and Western Advertising Agency, Racine and Chicago.

Mr. Fricker

Mr. Bower

★ HARRY F. BOWER has been named manager, Cast Iron Pipe and Foundry Department, James B. Clow & Sons, Inc., Chicago. He was formerly director of sales, Eddy Valve Co. and the Iowa Valve Co., Clow subsidiaries. He succeeds V. M. Wall, retiring.

★ JOHN J. CARROLL is elected a vice president of Neptune Meter Co., New York. He assumes over-all responsibility for sales of Neptune and Trident meters in the water works field.

★ GRAVER TANK & MANUFACTURING CO., East Chicago, advances S. E. Allen to vice president and general manager of all operations; W. M. Broxham moves up to vice president and general manager of plate and alloy divisions.

★ SOUTHWESTERNERS will now be served by John C. Moore, at Dallas, in the matter of Bermico sewer, irrigation and drainage pipe. He succeeds Raymond E. LaPlante, promoted to assistant manager, West Coast sales, at San Francisco.

★ SMITH & LOVELESS INC., Kansas City, announce the August 1st occupancy of their new and expanded plant for the manufacture of sewage lift stations. They also make a variety of water and sewage treatment equipment.

★ THE WHITE MOTOR CO. has purchased the assets of Reo Motors, Inc., Lansing, Mich. Reo will continue to operate as a division of White.

★ R. CARTER DYE has been promoted to general sales manager, Olin Aluminum Division, Olin Mathieson Chemical Corporation.

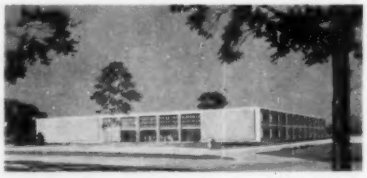
★ FRANK M. YEISER has been appointed director of filtration, Technical Division, Sparkler Manufacturing Co., Mundelein, Ill. He is regarded as a pioneer in new processes and equipment.

★ JACQUE JONES has been elected president of the Huber-Warco Co., Marion, Ohio.

★ BURGESS-MANNING CO., Libertyville, Ill., promotes S. G. Paddock to executive vice president.

★ EUGENE L. MILLER at 38 becomes the youngest president ever to head 124-year old Cooper-Bessemer Corporation of Mount Vernon, Ohio.

★ DORR-OLIVER INC. send the architect's rendering below of their new world-wide headquarters in Stamford, Conn. Located on an 18-acre landscaped tract and costing



two and one-half million dollars, it will house their 550 home office staff members after about May 1, 1958.

★ HYSTER COMPANY, Portland, Oregon, names Philip S. Hill executive vice president for all operations.

★ THE FINEST SALESMAN we ever heard of sold milking machines. He sold two of them to a farmer who owned one cow—then took the cow as down payment.

For Columbus' new expansion to 120 mgd....

Plant Manager, James H. Blodgett, and Uhlmann Associates, consulting engineers, faced tough problems in doubling the capacity of a previously expanded activated-sludge plant.

To get top plant performance, the complex instrumentation—both old and new—would have to be pulled together. Twenty year old meters would have to be modified, rebuilt, or replaced to work alongside today's improved models, telemetering total influent for the entire expanded plant to *one central control point.*

Here's why Simplex was selected to solve these problems. Simplex redesigned and will rebuild the *old* venturi tube receivers to perform dependably and accurately alongside the newest venturi tubes and meters—specially engineered by Simplex to Columbus' exact requirements. From this integrated system of old and new units spread over a big plant area, Simplex Orthoflow® will *electrically* transmit vital influent data to one central control point —instantly, accurately.

Your Plant. We'll gladly help you in expanding your old plant or planning a new one. Write today outlining your problem. Simplex Valve & Meter Company, Dept. PW-7, 7 East Orange Street, Lancaster, Pa.

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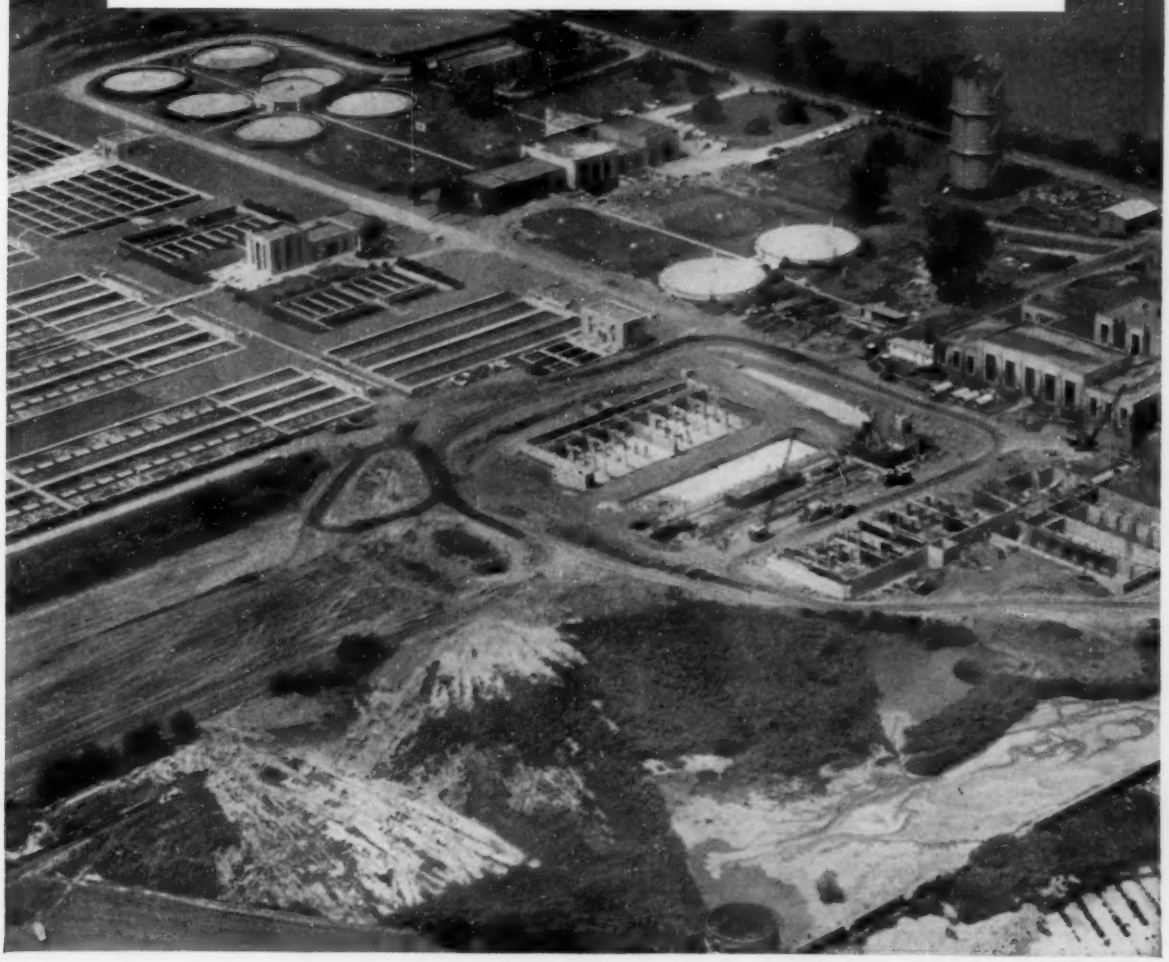

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with the

W&T *Quality-Quantity Chlorinator*

Select the residual you want and the new W&T Quality-Quantity Chlorinator will automatically maintain that residual. Immediate sensing of any change in a water's chlorine demand—as well as flow—automatically controls chlorine feed rate to maintain a desired residual. That is Dosage Automation with the new W&T Quality-Quantity V-notch Chlorinator.

DOSAGE AUTOMATION OFFERS THESE FEATURES:

Maintains

a selected residual, free or total, with automatic dosage control.

Anticipates

changes in chlorine demand.

Controls

Chlorine feed up to a full 100 to 1 range at rates to 2000 pounds of chlorine per 24 hours.

Provides

a record of chlorine dosages in p.p.m. and chlorine feed rates in pounds per 24 hours.

Utilizes

the proven W&T V-notch Variable-Orifice for accurate, wide range chlorine feed.

For more information about this new type of chlorination system write for Bulletin S-116.

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